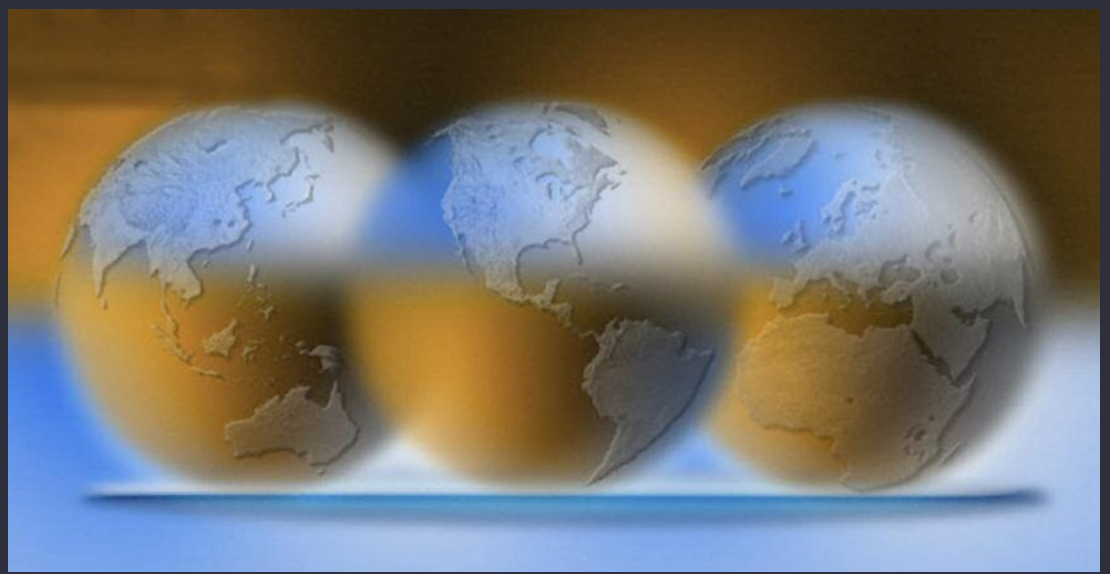
IMPACT ON A CHANGING WORLD



RTI INTERNATIONAL AT 50

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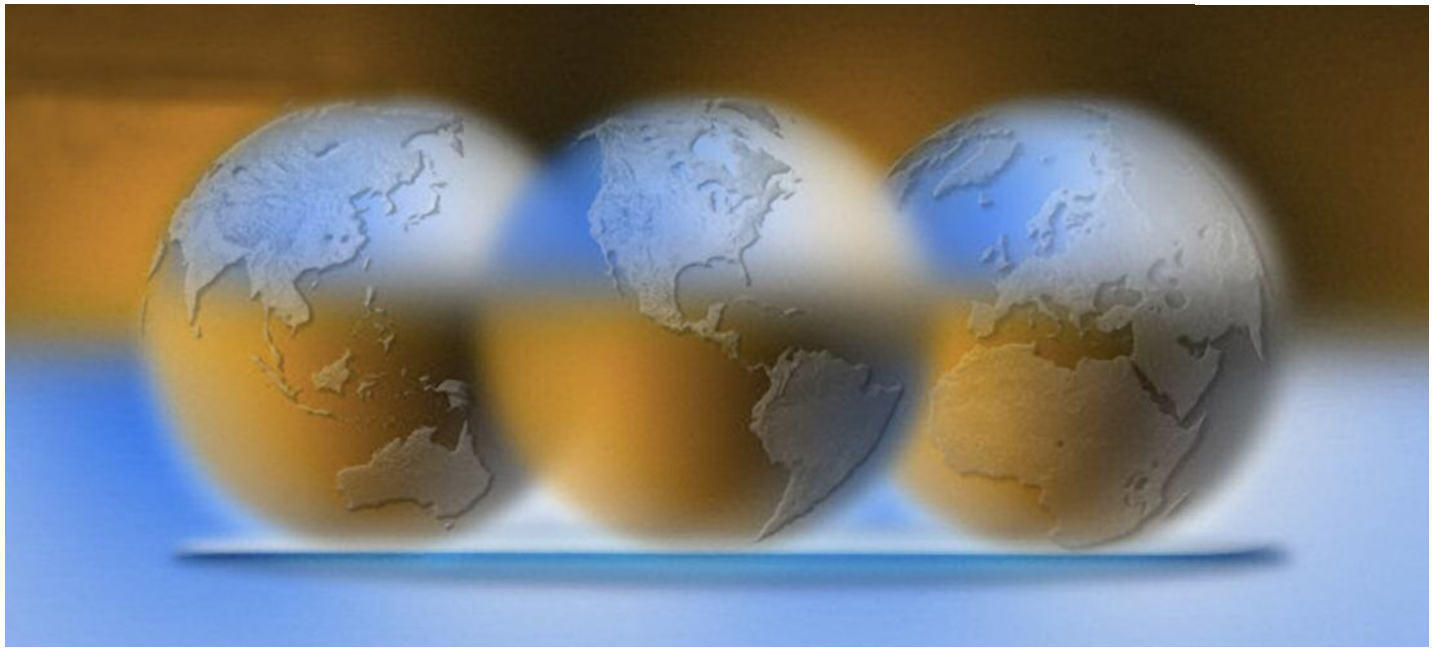

RTI INTERNATIONAL AT 50

by Russ Banham

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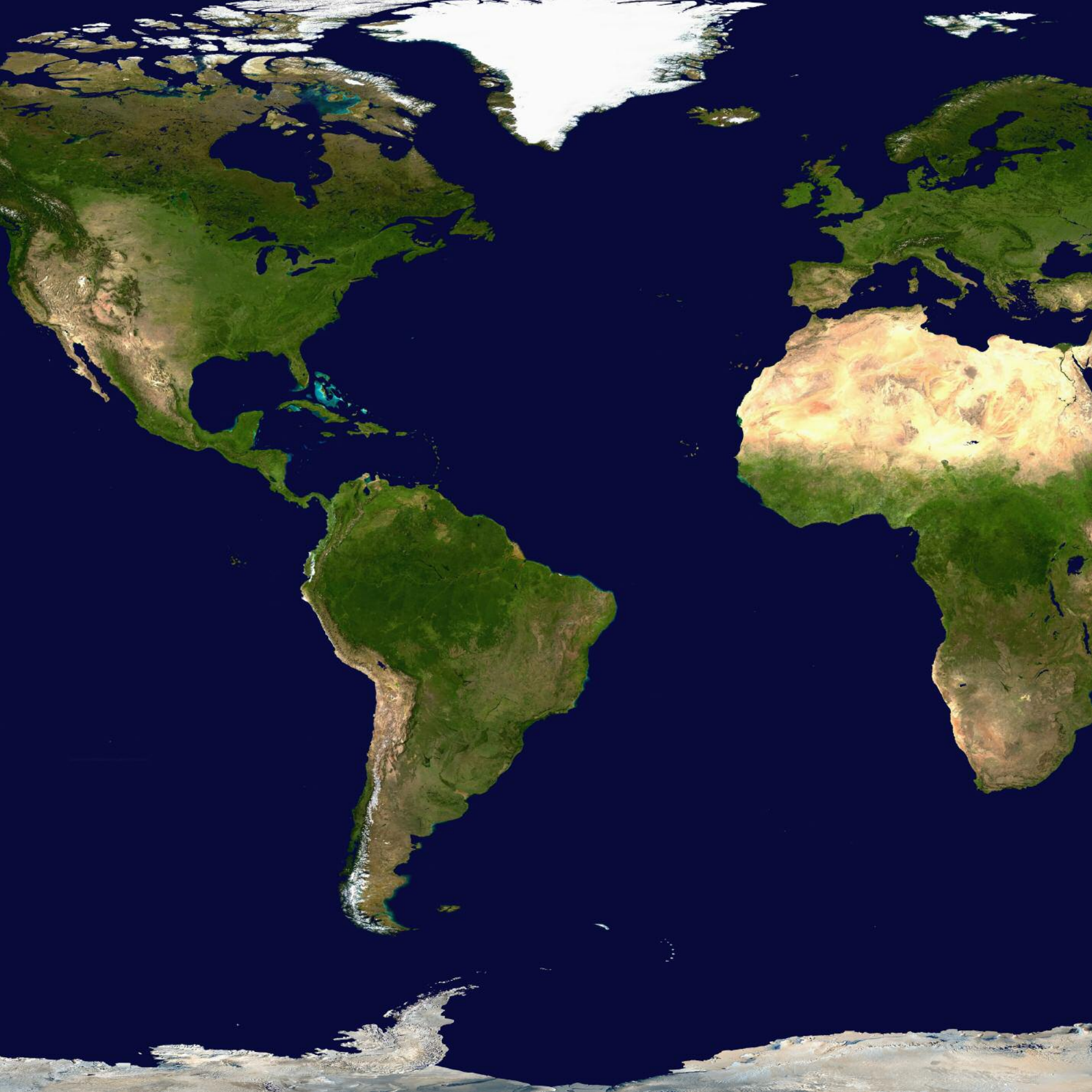
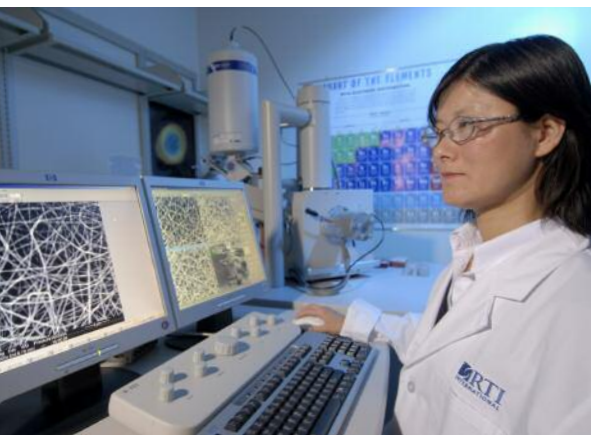


CHAPTER ONE

To Improve the Human Condition

Through research in the social and hard sciences, education, energy, statistics, the environment, democratic governance, and economic development, RTI International has a longstanding mission to improve the human condition. In the 1970s, RTI's Mass Spectrometry Center studied unusual odors emanating from the ground in Niagara Falls, New York; soon, steps were under way to correct the Love Canal disaster. Today, the institute is among the world's leaders in measuring trace amounts of chemicals, even at the nanogram scale. Here RTI's Jim Stephenson gets a sample plate ready for loading into one of RTI's mass spectrometers.

Over five decades, RTI has carried out more than 10,000 projects for hundreds of government and private-sector clients around the globe. More than 3,800 people working for RTI are now engaged in more than 1,000 projects in more than 40 countries.



RTI's research on nanofibers involves electrodes to power fuel cells, materials and structures that emit white light efficiently, and fibers that could be embedded in clothing to detect exposure to chemical or biological agents. RTI scientist Li Han, above, examines nanofibers using a scanning electron microscope. Opposite, RTI researchers Bill Zule, Sheryl Crabtree, Jen Uhrig, Grace Hall, Sean Squire, and Elizabeth Jaël discuss communication strategies for preventing HIV.

On a 180-acre campus in the eastern Piedmont of North Carolina, at the center of a triangle formed by the locations of its three founding universities, resides one of the world's leading research institutes.

Fifty years ago, at the institute's founding, the land was barren, comprising scrub pine and open fields. Much the same could be said of the region's economy, mired in postwar industrial and agricultural decline. In an effort to improve the region's financial health and stop a "brain drain" of smart, talented people leaving for jobs elsewhere, North Carolina business leaders, government officials, and academicians proposed a radical idea: build a new business park, with a research institute as the centerpiece; over time, these would grow, drawing jobs and prosperity to a place seriously in need of both. Research Triangle Park and, within its embrace, the Research Triangle Institute were born at the end of 1958.

A half-century later, the region's economy is among the nation's most vibrant, and the institute—trade-named RTI International in 2002—has undergone tremendous growth and had an ever more profound impact on making the world a better place to live.

Statistical sciences formed the core of RTI's original competence, its first contract calling for an analysis of morbidity data from Tennessee. Since then, its history has mirrored changes in national—and increasingly global—attitudes and priorities, and RTI has undergone a series of significant transformations. On the heels of President Lyndon Johnson's "War on Poverty" and a new social conscience in the United States, RTI expanded its work in the social sciences in the 1960s. Reagan-era cuts in quality-of-life programs and an emphasis on defense in the 1980s led RTI more deeply into research in technology, health care, space, and cultural aspects of the military. While involved in the environmental movement from the beginning, RTI rode a wave of new environmental and health consciousness into extensive research on air and water pollution and toxicology in the 1990s. By the end of the decade, the trend toward globalization had become unstoppable, and—as the world continues to "shrink," its people and systems increasingly interdependent—international work has been RTI's fastest-growing area since 1999.

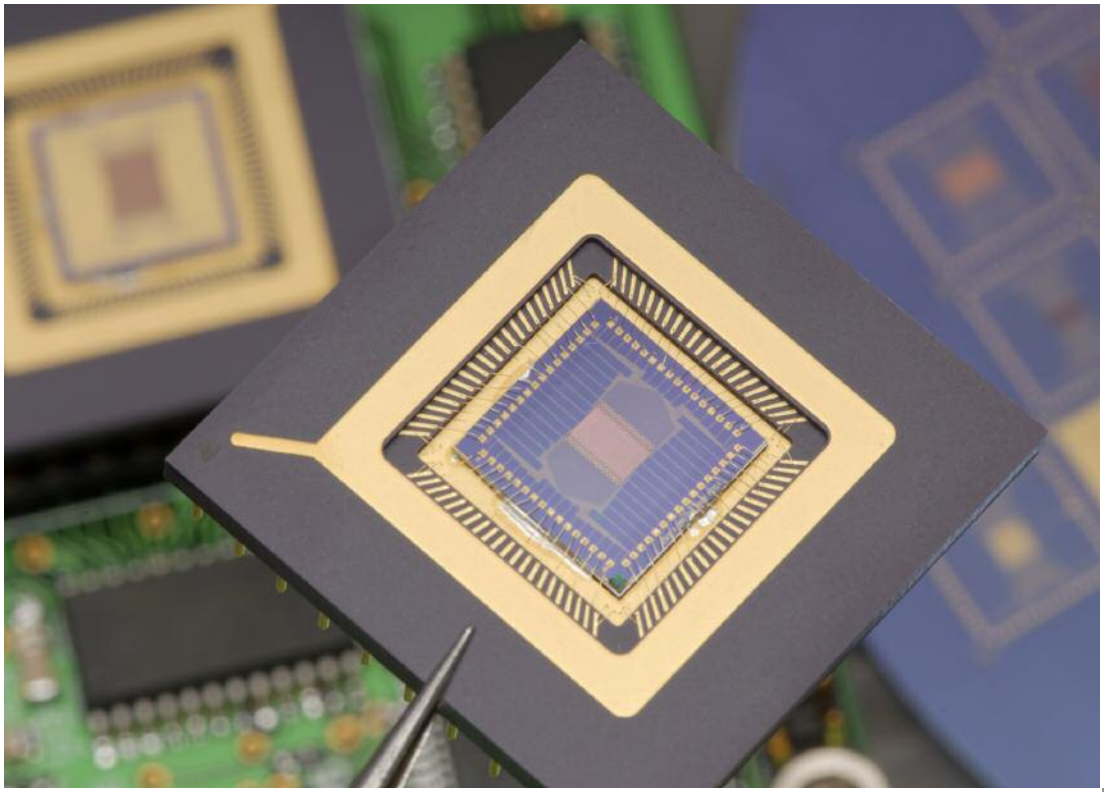
Over five decades, RTI has carried out more than 10,000 projects for hundreds of government

and private-sector clients around the globe. More than 3,800 people working for RTI are now engaged in more than 1,000 projects in more than 40 countries. They conduct a remarkable depth and breadth of scientific inquiry and statistical analysis—in fields as varied as agriculture, economics, education, government, health, public policy, technology, energy, the environment, medicine, electronics, and transportation. Diverse as they may be, these projects have one thing in common—a long-held mission to improve the human condition.

RTI's success, growth, impact, and ever-increasing scientific stature are attributable to its ability to leverage a cross-disciplinary approach to science. Researchers hold advanced degrees in more than 125 disciplines; their collaborative expertise is recruited to better understand, analyze, measure, and solve many of the most complex challenges to the planet and humankind.

Health research, RTI's largest field of study, spans a range of specialties from the human genome to global health education. Researchers across the institute are studying substance abuse among teenagers, the relationship between children's television viewing and obesity, and the health implications of the dietary supplement ephedra. Others are evaluating the prevalence of sexual assault among prison inmates and the relationship between hypothermia and infants with encephalopathy.

While one multidisciplinary team of researchers recently forged a unique private-public partnership to bring an affordable new tuberculosis drug—PA-824—to clinical trials, another group developed a data-mining and predictive analytics software program to help police forces optimize their resources to improve public safety.



RTI has been at the forefront of groundbreaking research to make coal a more efficient, cleaner, and affordable energy source. Its novel T-2749 fluidized-bed desulfurization sorbent, opposite, can remove large amounts of pollution from synthetic gas; in 2004, RTI won an "R&D 100" award for the technology. Microelectronics is another area of expertise for RTI; the micro Faraday cup array at left is part of a miniature mass spectrometer project, designed to detect ions with high spatial resolution. From hard science to social research, RTI is helping the United States understand issues facing its older citizens.

Other teams have searched for ways to cost-effectively expedite drug discovery and development; examined the health impact of trichloroethylene, a common industrial and dry cleaning solvent; studied the absorption, distribution, metabolism, and excretion of drugs in animal models to assist in the development of effective new treatments for AIDS and other diseases; and examined misoprostol, a drug normally used to treat ulcers.

In other areas, RTI is developing algorithms to translate e-mails from one language into another and working on strategies to improve the federal Upward Bound program for disadvantaged high schoolers. Additional projects are aimed at cleaner energy, more effective government in developing nations, better education, and more productive technology. The fruit of this work is the material upon which public policies are made to improve education, the environment, health care, and other daunting human and planetary issues.

What differentiates RTI from other research institutes is that, on nearly every project for every client, RTI applies its world-class knowledge and expertise from multiple domains to achieve a broader perspective on the world's most vexing problems—and then works toward greater understanding of those problems and more imaginative solutions to them. This important distinction, coupled with RTI's mission of improving the human condition, has made RTI a unique and rewarding place to work for some of the world's most esteemed scientists. They are drawn by the freedom to pursue high-profile and high-impact

research projects in the service of humanity—alongside peers from other scientific disciplines and often in collaboration with researchers from the institute's three founding universities.

For the past nine years, Victoria Franchetti Haynes, Ph.D., has been at the helm of RTI International. The institute's third president, Haynes is a chemist by training and has spent much of her career in the private sector. She has sharpened the mission of RTI, emphasizing the role of strategic planning, and—in an echo of the strategy by which RTI's founding president built the institute's first renowned staff—has made explicit an effort to further elevate the institute's scientific stature. Haynes also has fostered a more entrepreneurial spirit institute-wide. For the first time in its history, for example, RTI has spun off promising technologies for commercialization and has made acquisitions to bolster its capabilities and intellectual capital. RTI also has furthered its global reach. Haynes presides over an organization that brims with innovation to address diverse global, regional, and national challenges. As she puts it, "We pretty much cover the scientific waterfront."

When large-scale disasters such as hurricanes or oil spills have threatened life, RTI has been there to assist. When developing countries have needed help creating local democratic governance or building a modern public service infrastructure or education system, RTI has helped plot a course. When countries have agonized over social ills such as alcohol or drug abuse, RTI has been there to shed light on the nature of the problem and ways to solve it. When human life has been undermined by disease, RTI has been there, working on prevention or a cure.

Whenever headlines focus attention on a major national or worldwide issue, chances are that RTI is there, improving understanding and working on a solution. At RTI, this is science with a purpose—driven by a principled mission of asserting the dignity and improving the condition of humankind.

RTI's mission to improve the human condition is evident in its work worldwide. In South Africa, left, RTI has helped improve the country's education system and is working to halt the spread of AIDS. In El Salvador, opposite, RTI is working to improve the nation's literacy rate. Above, the Cox Building on RTI's main campus honors Gertrude Cox, the "First Lady of Statistical Science." Statistics was RTI's first discipline.

They are drawn by the freedom to pursue high-profile and high-impact research projects in the service of humanity—alongside peers from other scientific disciplines and often in collaboration with researchers from the institute's three founding universities.

The "International" in RTI

In the fall of 1961, RTI took on its first international project in Nigeria; two years passed before the institute undertook its second, again in Nigeria. It's a different story today, with diverse projects spanning the globe in dozens of developing countries.

RTI's work is predicated on helping governments in developing nations build governing infrastructures; improving water quality, energy, agricultural production, sanitation, pollution, literacy, and health care; and helping to optimize the allocation of resources. Although diverse, this work is closely aligned with the institute's mission of improving the human condition.

RTI works chiefly with USAID, whose primary objective is to assist developing countries while furthering U.S. foreign policy objectives. Other clients include the World Bank, the Asian Development Bank, the United Nations, and the developing countries themselves. RTI was a founding member of a USAID consortium called WASH (Water and Sanitation Health), and it dispatched many scientists over the years to third-world countries to analyze water and sanitation problems and then train local technicians in remediation tactics. The institute helped the government of Morocco plan and carry out measures to address malnutrition, and in the 1970s it assisted the fast-growing city of Tamale, Ghana, in executing plans for better health care services, roads, drainage ditches, and other infrastructure. "Ghana was rapidly urbanizing, which caused demands on services like sewers, water, and streets," explains Jim McCullough, Ph.D., who led the project.

RTI's international projects proliferated in the late 1970s and through the 1980s. They ran the gamut from developing an R&D center on solar, wind, and hydroelectric power in Morocco to helping the central ministries of Indonesia craft national laws permitting local-level governance.

Dan Goetz, who joined RTI's Office for International Programs (OIP) in 1983, recalls his first USAID-funded project to create a property tax system for local governments in Tunisia—"something that would make it possible for Tunisian towns to no longer hand-copy their tax rolls but actually start managing data," he says. "Database software for microcomputers had just become affordable, and it would give the local governments an effective way to see immediately who was and who wasn't paying their property taxes. We led the creation of this software."

By 1987, more than 50 RTI staff members provided research and technical assistance to developing countries, undertaking projects in Senegal, Mexico, Tunisia, Ivory Coast, Malawi, and Nepal, among other places.

Local Governance in Nepal and Indonesia

In Nepal, RTI provided training and technical assistance to improve the financial health of town governments. "Nepali cities were doubling their population every nine years, as compared to a normal urban growth rate in developing countries of two to three percent," says McCullough, who directed the project and lived with

his family in Nepal while on assignment. "The task was to help city officials mobilize local monies to keep up with existing services like water, roads, and sanitation." Funded by the World Bank, the project called for working with eight local Nepali governments. "Our basic approach was to identify local governments doing things well and then present them as examples to other municipalities," McCullough explains. "The client was so pleased with our work that we were engaged to go national with it—beyond just the eight towns."

RTI also helped the central ministries of Indonesia craft national laws permitting local governance. "This was a much bigger project than Nepal, with a country ten times larger and spread out among thousands of islands," McCullough notes. The successful completion of this USAID-funded project launched a long relationship between RTI and the Indonesian government.

Education has been another focus of international projects. RTI and Harvard University developed methods enabling education agencies in developing countries to improve the planning, monitoring, and evaluation of their national education systems. This work led to STEP (System for Tracking Educational Progress), a microcomputer software package developed by the institute to evaluate school populations, enrollments, dropouts, and graduates. STEP also produced cost analyses and needs assessments for teachers, facilities, and equipment. Five Central American countries and the government of Egypt implemented STEP in the mid-1980s.

In the 1990s, OIP became the institute's new Center for International Development (CID), which offered its services in urban and regional finance and management; policy support systems; health, social, and human development; and the environment. The institute's agricultural economists, for instance, worked with developing countries like Mali to improve farm productivity and food supply and distribution, while its education specialists provided critical advice on literacy to the country's Ministry of Education. Other economists improved tax collection procedures and increased the efficiency of additional administrative tasks in Nepal, the Philippines, Thailand, and Egypt. Modern financing systems were developed for Indonesia, and environmental regulations were crafted for Thailand. Other RTI researchers, led by Sally Johnson, studied how women in developing nations could contribute to the economic growth of their countries. Working with USAID's Office of Women in Development, they created simulation models and prepared presentations for high-level policymakers.

In Egypt, also during the early 1990s, RTI helped develop a policy analysis, communications, and information strategy for the Ministry of Education. In the Philippines, RTI staff trained local officials in management and finance, and in South Africa, where negotiations were under way to end apartheid, the institute developed a unique dialogue support tool called APEX to assist policymakers assessing the future of education in a post-apartheid government. APEX focused the dialogue by sidelining the negotiators' divergent opinions, thereby facilitating a climate of fact-based cooperation to provide equal opportunities for education to all citizens.

Governing After the Soviet Breakup

When the Soviet Union collapsed, researchers helped the constituent countries, including Russia, develop decentralized governments. "No country in the world was as centralized from a government standpoint as the USSR," says Ronald Johnson, Ph.D., who was then vice president of an RTI group that included CID. "Functionaries took their marching orders from people at the top. Now, systems were being created to provide more government authority at the local level."

In research funded by USAID, RTI worked with municipal officials to diagnose existing financial management systems. Based on this research and the priorities of towns and cities, the institute developed training programs for government staff and created

RTI's work reaches all corners of the globe. RTI has long had a presence in Africa; in fact, its first foreign project, in 1961, was in Nigeria. RTI has been active in Indonesia for more than two decades. Its work touches many facets of life in the region, including governance, public finance, environmental management, health, education, and private-sector development. Here a rainbow forms as workers harvest rice on the island of Java.

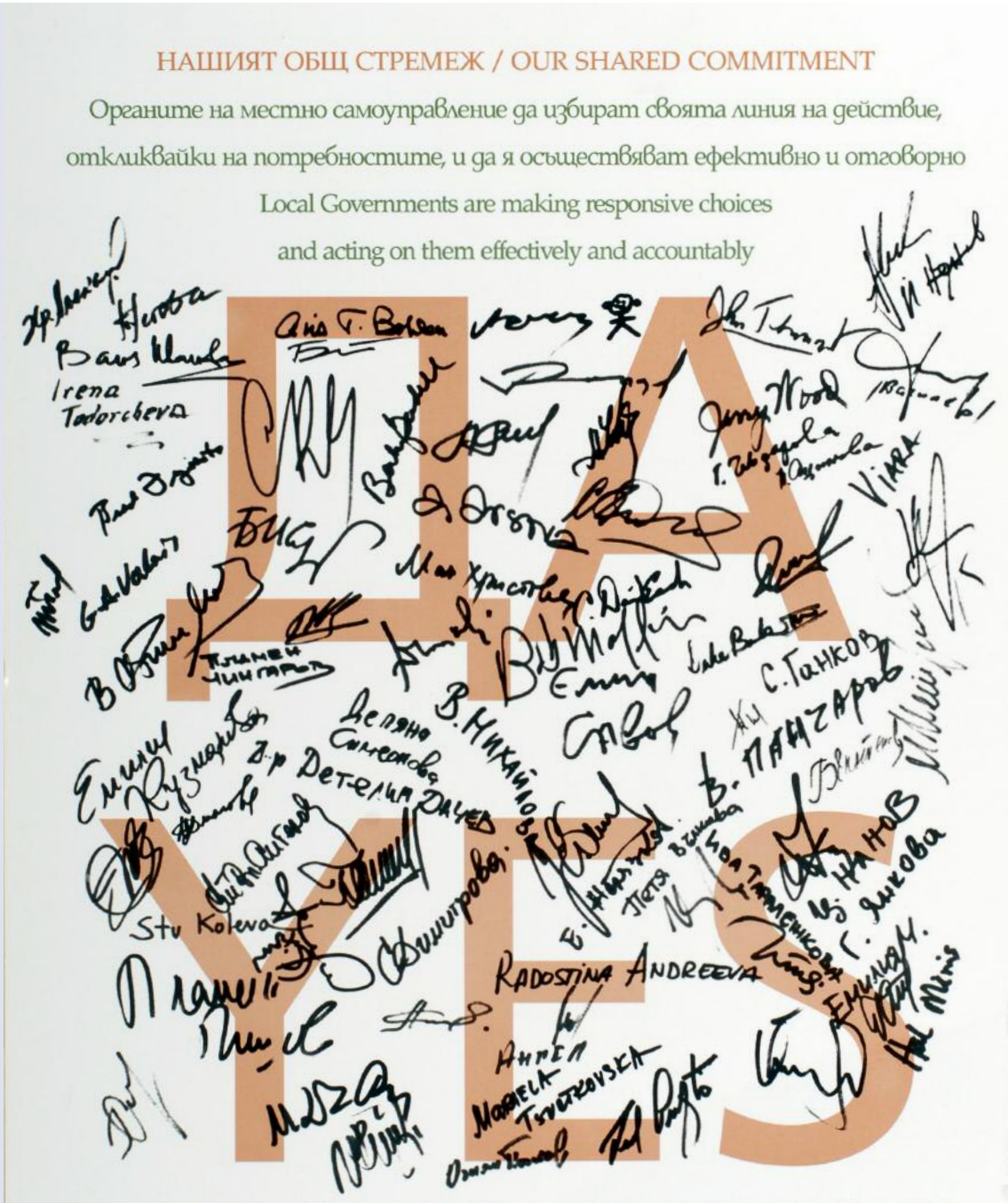
computer programs to manage accounting, budgeting, capital finance, personnel management, performance measurement, and property tax administration. "We put advisers in maybe half a dozen cities in Russia; at the same time we were undertaking similar projects for the fledgling local municipal governments in Ukraine, Kazakhstan, and other central Asian republics," McCullough recalls. By the end of the 1990s, RTI International had crossed the geographical boundaries of 105 countries, including Ethiopia, Swaziland, Haiti, Cambodia, El Salvador, Peru, Uganda, Zambia, the Republic of Tajikistan, Thailand, and Vietnam.

Democratic Governance After 9/11

The terrorist attacks in the United States on September 11, 2001, and the subsequent overthrow of Saddam Hussein in Iraq had a dramatic effect on RTI, leading to one of the institute's largest and most challenging projects and focusing new attention on the Middle East. Since 2003, RTI has been working with Iraq's government under a contract with USAID to improve the quality of governance and public services and to help Iraqi citizens raise the quality of life in their neighborhoods.

Under another project for USAID, begun in January 2003, RTI led the implementation of Pakistan's Education Sector Reform Assistance (ESRA) program. Until recently, fewer than 30 percent of Pakistani children had ever attended school, and only half that number had completed the fifth grade. The literacy rate was 42 percent, and only 51 percent of primary school teachers had more than a high-school education. As the project ended in 2007, efforts were under way in two Pakistani provinces to help district governments work with parents, teachers, administrators, and others to improve schools' effectiveness short-term, develop long-range improvement plans, and access funding. By focusing on the needs of Pakistani children, RTI was strengthening the country's future.

The institute also has been working with the Ministry of Education, Youth and Sport of the Kingdom



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These are the signatures of Local Government Initiative (LGI) partners, including Bulgarian mayors, municipal association leaders, the U.S. Ambassador to Bulgaria, USAID officials and LGI staff.

of Cambodia since 2004—with USAID funding—to modernize the education curriculum for students in grades one through nine and to increase collaboration between schools and communities—especially by encouraging parents and children to take an active part in education. "When parents, students, and teachers can see the value and relevance of what is taught and learned, children will stay in school longer, even in rural areas, and learn more," says George Taylor, RTI's director of the project in Cambodia.

New curriculum standards completed in 2006 established literacy, numeracy, life skills, and other basic education goals to be reached by all students in four core subjects—language, mathematics, science, and social studies. RTI is helping the ministry implement the standards in support of a national policy to increase the relevance and quality of basic education. The multidisciplinary project involves collaboration with a number of other RTI projects, donors, and nongovernmental organizations, including UNICEF, the European Union, the Japan International Cooperation Agency, the World Bank, Handicap International, and World Education.

Similar work is under way in other developing nations. In El Salvador, for instance, RTI is working to improve the country's health, decentralized and democratic governance, education, public finance systems, and information and communications technology. RTI opened a permanent office in El Salvador in 2003.

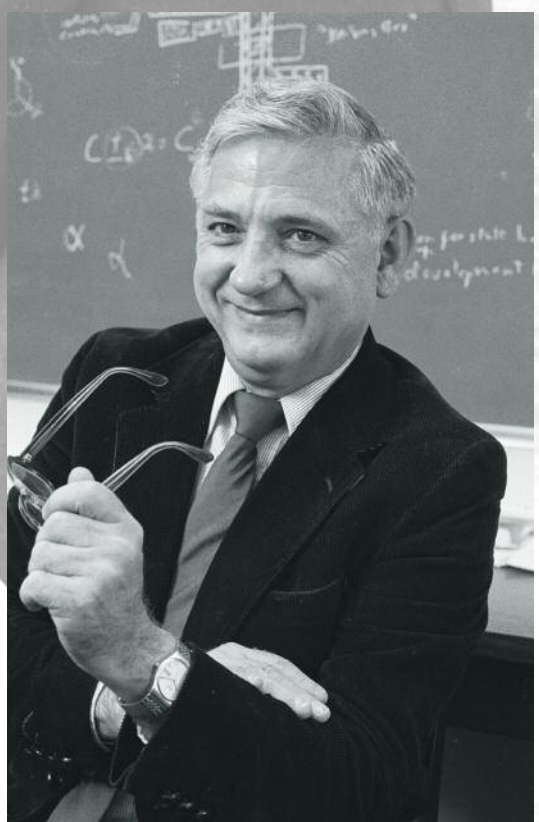
Meanwhile, in Africa and South America, Amber Gove, Ph.D., an IDG senior research analyst, is working to increase literacy rates. "A good chunk of the population in Peru, as late as the sixth grade, cannot read and write," she says. In partnership with the World Bank, RTI produced a video to encourage parents to talk to their children about the importance of reading, as well as to motivate the children to read to them. The video has been translated into thirteen languages. "We're trying to demystify reading," says Gove. "It's just another way we can improve the human condition."

In Guatemala, RTI is connecting schoolchildren to the Internet in support of the Strategic Alliances for Social Investment Project (Alianzas) to increase private-sector investment in health, nutrition, and education. Alianzas Chief of Party Tere Ligorria, above, shows the Internet to children and their mothers. A poster, opposite, signed by municipal leaders in Bulgaria, affirms "da" to a stronger and more accountable democratic government, in formation since 1997 with RTI's help. RTI's largest democratic governance project is in Iraq, right.

CHAPTER TWO

"Nothing Here But Pine Trees and Possums"

The vision of RTI's founders was nothing short of revolutionary—a major research institute in the geographic middle of three North Carolina universities. Fifty years ago, few could imagine what would be built on the fields where RTI's first president, George Herbert, opposite, stood in 1959. The universities provided the institute with needed staff, such as Dr. J. J. "Jimmie" Wortman, an electrical engineer from Duke who came to RTI through the university's graduate program in solid-state electronics.



North Carolina Governor Luther H. Hodges was pivotal in founding RTI, joined by business leaders like George Watts Hill, chairman of the Durham Bank & Trust Company, and faculty like William Little, inset, a professor at the University of North Carolina. Above, Hill, right, and Hodges share a few words at the dedication of RTI's Ragland Building. Opposite, numerous research buildings will soon sprout alongside the scrub pine across the former Jenkins Road, seen here in 1959. Jenkins Road was cut in two when Interstate 40 was built; the north side was turned into West Institute Drive.

The United States was enjoying a time of great economic expansion in the early 1950s—not that you could tell in North Carolina. As most of America rushed away from assembly-line mechanical production toward new promises in science and technology, the Tar Heel State stayed mired in an old economy.

The World War II-fueled growth in manufacturing was over, and the state's legacy industries—tobacco, furniture, textiles, and paper—were eliminating jobs through automation. North Carolina was investing heavily in higher education statewide, yet a steady stream of bright young people born, reared, and educated in North Carolina left for work elsewhere—and by 1950, more than 20 percent of the native population was living in other states. For those who remained, per capita income was among the lowest in the nation.

Sluggish commerce meant less tax revenue to build schools, roads, and other infrastructure, handicapping the state's ability to attract companies seeking to relocate. In the booming postwar economy, North Carolina was being left behind.

Great Minds Think Alike

Romeo Guest was well aware of the state's desperate need to attract new technology-based industries. As president of Romeo Guest Associates, a large building contractor in Greensboro, he was consumed by the idea of a science-centered business park in North Carolina that could diversify the state's stalled commercial base. While attending the Massachusetts Institute of Technology, he had witnessed the development of Boston's technology corridor, which circled the city along Route 128. The Boston area now pulsed with entrepreneurial energy, much of it supplied by MIT, Harvard, and other local universities. Out West, Stanford University's new research institute was playing a similar role in the industrial development of northern California. Could the same occur in North Carolina?

The idea was not that far-fetched. The federal government was outsourcing much of the research it had undertaken during the war to the private sector and to nonprofit research organizations like Stanford Research Institute and Battelle Memorial Institute, located next to Ohio State University in Columbus. North Carolina boasted three major institutions of higher learning—Duke University in Durham, North Carolina State College (now North Carolina State University) in Raleigh, and the University of North Carolina at Chapel Hill—each with solid mathematics and science departments, top-notch faculty, and expanding research programs. The universities were within several miles of each other, a geographic happenstance presenting the possibility of abundant academic resources for a local contract research institute. Such an institution, in turn, would help lure new technology-based industries and government agencies to the state, boosting the economy and providing jobs to university graduates. A research institute in the midst of these fine universities could anchor the science park that would plug the brain drain that bedeviled North Carolina.

Or so Guest mused. He was not alone. Brandon Hodges, North Carolina's former treasurer and an executive at Champion Paper in Canton, North Carolina, also considered ways to resuscitate the state's moribund economy. So did Walter Harper, who ran North Carolina's state department of commerce and industry. "Having those three universities so close together was a unique

Were it not for the coincidental nexus of three great universities—the University of North Carolina at Chapel Hill, Duke University, and North Carolina State College (now North Carolina State University)—RTI might never have been established. The geographic points of a triangle formed by the universities' locations provided a name for the fledgling research institute, and their faculty and graduates offered invaluable research assistance and staff. Each institution has its icon: The Bell Tower at NC State, above, serves as a signpost for students traveling to classes. The Old Well at UNC, right, a familiar rest stop, beckons in the early days of autumn. The Duke University Chapel, opposite, offers solace and inspiration.

situation, and the more we thought about it, the more we were convinced they offered us a golden opportunity," Harper told *North Carolina* magazine.

The three men began working together on the concept of a research park. They met frequently at the Sir Walter Raleigh Hotel in Raleigh, the state capital, where they would "drink, eat, and dream," Harper once said.

They also began to impress their ideas upon other business leaders and public officials. Chief among them was North Carolina's governor, Luther Hodges (no relation to Brandon Hodges). Guest recalled a meeting with Governor Hodges in his office on December 31, 1954, during which Guest looked at a map and noted for the first time that the three universities formed the points of a triangle. This revelation provided the names for the endeavor—Research Triangle Institute and Research Triangle Park.

Governor Hodges reached out to the universities' faculties and administrators for their input and involvement. Many were in favor, such as Paul M. Gross, a Duke University vice president and renowned chemist who had been awarded

"Having those three universities so close together was a unique situation, and the more we thought about it, the more we were convinced they offered us a golden opportunity," Harper told *North Carolina* magazine.

Paul M. Gross, left, and Marcus E. Hobbs, second from left, hold places of high honor at RTI. Former chemistry professors and senior administrative officers at Duke University, they served for more than 25 years on RTI's Board of Governors and the board's executive committee. Here they pose with George Watts Hill in 1984 after a long-service recognition event that also honored Margaret T. Harper, right.

the Presidential Medal of Merit by President Harry Truman. Others included William Whyburn and William Little from the University of North Carolina (UNC), Marcus Hobbs, Ph.D., of Duke University, and Cary Bostian and Malcolm Campbell of North Carolina State College.

Buoyed by the support, Hodges formed the Governor's Research Triangle Development Council, headed by Robert M. Hanes, chairman of Wachovia Bank in Winston-Salem. The council comprised officials from the three universities and influential business leaders. Its working committee drafted a statement of purpose that touted North Carolina's "unique combination of educational and research resources and communications facilities … eminently suitable to the fostering of industrial research."

The working committee also identified the role the universities would play in the science park: "to stimulate industrial research by the research atmosphere their very existence creates, and to supplement industrial research talents and facilities by providing a wellspring of knowledge and talents."

The council suggested forming a nonprofit organization to secure funding from contributors on a tax-favorable basis. In September 1956, the nonprofit Research Triangle Committee was formed and replaced the council, though the members were largely the same. The new committee was charged with determining the feasibility of a science-based business park and how it would be organized, operated, and funded. Its full-time executive director was George L. Simpson Jr., a sociology professor who was on leave from UNC. Bob Hanes from Wachovia was appointed chairman. Simpson kept the committee members focused, solicited the interest of

potential clients of the proposed institute, and was adept at advertising its merits. Joining him on his many cross-country marketing campaigns was Elizabeth Aycock, the committee's secretary, and a score of faculty members from the three universities.

"If Governor Hodges was the heart, Simpson became the brain of the Triangle," wrote W. B. Hamilton, a Duke University history professor.

Sputnik Helps the Cause

Having established the feasibility of a contract research institute, the committee gave the idea more focus and shape. Research Triangle Institute would carry out both fundamental and applied research at a high scientific level. It would require no operating subsidy from either the state or the three universities with which it would be affiliated; it would be chartered as a nonprofit organization; and it would make its own way financially. If the institute failed, the universities would divvy up the assets.

The Research Triangle Committee's marketing efforts were abetted by the Soviet Union's launch of the *Sputnik 1* satellite in 1957, which cast a gloomy shadow on America's seemingly inferior scientific accomplishments. With America feeling the fervent desire to catch up, the committee realized it needed more than a concept to secure money. It required a specific geographic location for the research park and institute—in a word, *land.*

Enter Karl Robbins, a textile magnate who had sold his extensive holdings in the state. Robbins agreed to buy and develop a large swath of property for the proposed park, calling it a "wonderful idea and a moneymaker." Guest was authorized to secure options to purchase up to 5,000 acres of land in southeastern Durham County, and by the end of 1957 he had optioned 3,559 acres. Robbins formed a for-profit company called Pinelands Corporation to acquire the parcels.

The timing could not have been worse. A national economic recession discouraged financial investments in Pinelands, nearly derailing the project. The following August, Governor Hodges approached Archie K. Davis for advice. Davis had become Wachovia's board chairman following Hanes' death in late 1957. Davis proposed reclassifying the Research Triangle Committee into a foundation chartered as a nonprofit corporation. The foundation would buy Pinelands at cost and without a profit to Robbins' Pinelands Corporation. Rather than solicit financial investments to purchase the optioned land, it would seek contributions from individuals and businesses. The profits from future land sales would support the foundation in developing the park.

The New Institute Is Born

The Research Triangle Committee took Davis' suggestions to heart and chartered the foundation. Davis subsequently hit the road on a major fundraising campaign that netted $1.25 million in 60 days. "The corporate citizens of North Carolina saw that, if successful, such a venture could turn out to be exceedingly helpful to the economy of the state," he informed *North Carolina* magazine. "They responded with alacrity." Ultimately, he raised more than $2 million, of which $500,000 would be startup capital for the fledgling research institute.

At 11:41 a.m. on December 29, 1958, articles of incorporation were filed for Research Triangle Institute. A board of governors and executive committee representing the university, business, and professional communities would oversee the new organization's management. Eleven days later, on January 9, 1959, Governor Hodges launched the Research Triangle Park at a press conference at the Sir Walter Raleigh Hotel, calling it "one of the most significant events of recent years in North Carolina." In attendance were more than 200 business, university, and state officials, augmented by newspaper, television, and radio reporters. The governor announced that Davis had collected funds totaling $1.45 million to acquire Pinelands Corporation and its landholdings, which would be passed on to the newly formed Research Triangle Foundation. He singled out Davis, Hanes, and George Watts Hill, chairman of the large Durham Bank & Trust Company, for their "magnificent leadership and unselfish service," and he noted that physical development of the park would begin immediately. The first building constructed in the research park, headquarters of the foundation, would be named for the late Bob Hanes.

The governor then unveiled the centerpiece—Research Triangle Institute. He explained its novel relationship with the three universities. He also described its initial research field—statistics—and how word-of-mouth promotion would attract private companies, government agencies, and other enterprises to plant stakes in the park. He then introduced the institute's new president—George Herbert. Few there that day could imagine what RTI would become 50 years hence.

"Infinite Patience and Great Vision"

George R. Herbert Jr. was born in Grand Rapids, Michigan, on October 3, 1922. He was an only child whose mother managed a telegraph office in East Lansing, where he grew up. His father was a district manager for the State of Michigan. As a young man, Herbert worked nights at his mother's office to put himself through Michigan State University (MSU). His ambition was to become an admiral in the navy, and after two years he left MSU and received a congressional appointment to the U.S. Naval Academy in Annapolis, Maryland, graduating in June 1945 with a bachelor of science degree in electrical engineering.

World War II had ended, affecting the young ensign's chances of becoming an admiral. Herbert left the navy to become an instructor in electrical engineering at MSU, but the pay was low and, with a young wife and growing family to support, he took a higher-paying albeit unsatisfying job at a well surveying company. Serendipity then intervened. On the way back home from the navy, Herbert had met Jesse Hobson, Ph.D., at a tavern. The two men hit it off and exchanged phone numbers. Hobson was

RTI's first president, George R. Herbert, above in 1959, was the right man for the times. In 1989, as he stepped aside to the new position of vice chairman, he said the following about RTI's early years: "I am reminded that the then-new and untested RTI had two distinct advantages. First, it was identified with three major universities. Second, we recruited an initial cadre of individuals who, being recognized nationally and internationally in their respective disciplines, brought their own reputations to a new organization that had not yet started to build the institutional reputation we enjoy today." The push to establish RTI was aided by the 1957 launch of *Sputnik 1*, opposite.

RTI's first quarters were in the Home Security Life Building in Durham. George Herbert and William Perkins, RTI's longtime CFO, each had a work area. In between, Perkins recalled, "was enough space for roller skating." Staff such as Claudette Free, left in photo at right, and Susan Mayton of RTI's Chemistry and Life Sciences unit gradually came on board. RTI's first sign, opposite, welcomed visitors.

on his way to Palo Alto, California, to become the executive director of the new Stanford Research Institute (now named SRI International).

Herbert phoned Hobson, who offered him a job as his administrative assistant. Herbert assented, packed up his family, and moved to Palo Alto. There were 40 employees at the nascent institute. Earning Hobson's respect and the high regard of the institute's scientists, Herbert steadily climbed the ladder, reaching the second highest rung—executive associate director—in 1955. "George ran the joint with no complaints from scientists or administrators, and that is saying a lot," recalls a friend from that period. "He was infinitely patient and had great vision."

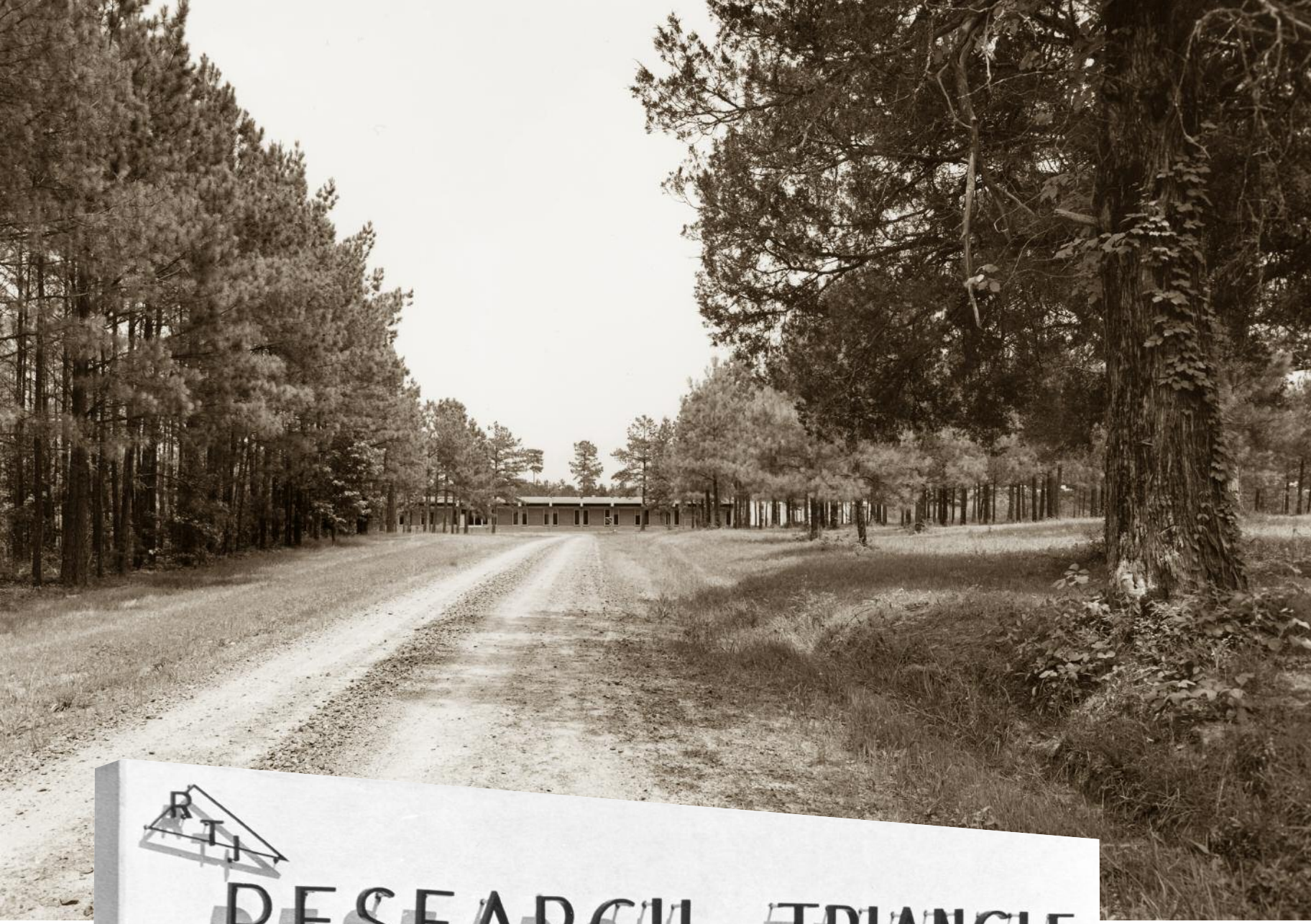
Herbert knew that without a Ph.D. his chances of becoming executive director were slim. In 1956, he left SRI to become the treasurer of American and Foreign Power Company in New York, where the opportunity to become the utility holding company's president was better. No sooner had he dusted off his desk when George Watts Hill, who had replaced Hanes as chairman of the Research Triangle Committee, called to invite him to North Carolina. Hill explained that he wanted to "pick his brain" about contract research institutes, given his resumé. Herbert made the trek and impressed everyone he met. When Hill went looking for someone to lead the Research Triangle Institute, Herbert's name was in the hat.

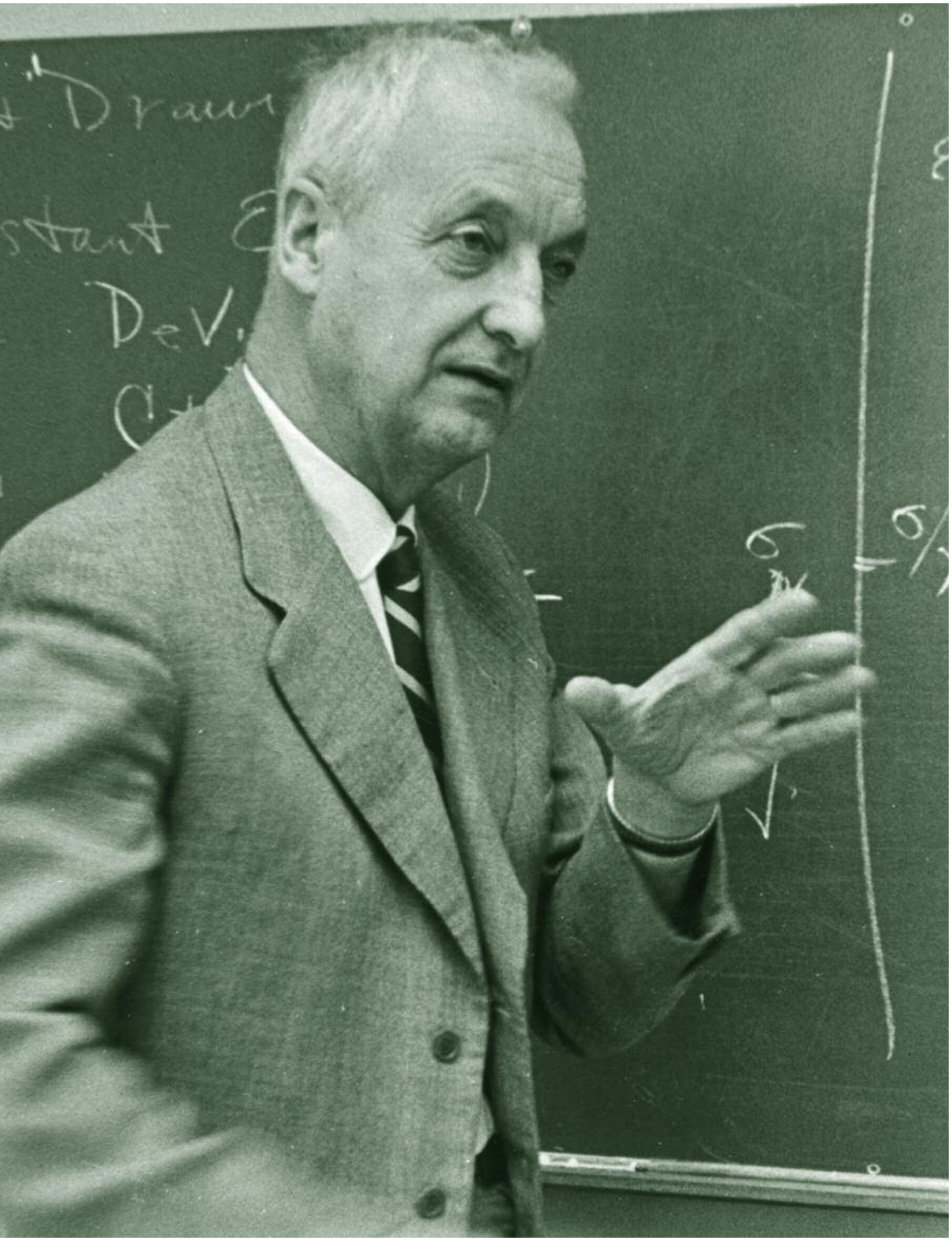
Bold Visions, Humble Beginnings

In December 1958, George Herbert became RTI's first president and its first employee. The institute's assets comprised $500,000 from Archie Davis' fundraising and the promise of a 157-acre campus provided by the foundation. Employee number two was William Perkins, who had worked under Herbert at American and Foreign Power as a corporate accountant. "When we got to the park, there was nothing here but pine trees and possums," Perkins recalls. "There were no buildings, so we set up shop in Durham on the second floor of 505 West Chapel Hill Street. There were no partitions. George sat at one end, and I sat at the other. In between was the secretary we shared, although my wife, Nancy, did a lot of the typing."

Perkins had doubts about the longevity of his new job. "Newspapers writing about the park would precede any article with a big *if*, as in, '*If* the Research Triangle Park succeeds, …'" he says. "What was absolutely critical to the park's success was RTI's success. We were the linchpin."

Two occurrences helped RTI secure a concrete footing. One involved the initial field of contract research, statistics. Three professional staff members of the Institute of Statistics at UNC transferred to RTI's payroll in March 1959 to begin work on RTI's first project: an analysis of morbidity data collected from a survey in Nashville (the UNC Institute of Statistics had some contracts in the till, which were passed on to RTI). The contract value was $4,500. Since the park was bereft of buildings, the statisticians worked at their desks at UNC. The following month, they were joined on a part-time basis by Gertrude Cox, Ph.D., a veritable legend in the


RTI
RESEARCH TRIANGLE
INSTITUTE



field, lauded as the First Lady of Statistical Science, and her colleague, Alva Finkner, Ph.D.

Cox was the first woman to become a full professor and department head at NC State and the first person anywhere in the country to lead a university department of statistics. She also founded UNC's Institute of Statistics, which expanded through the years to include the statistics department. She later was elected to the prestigious National Academy of Sciences, becoming one of only 21 female members at the time.

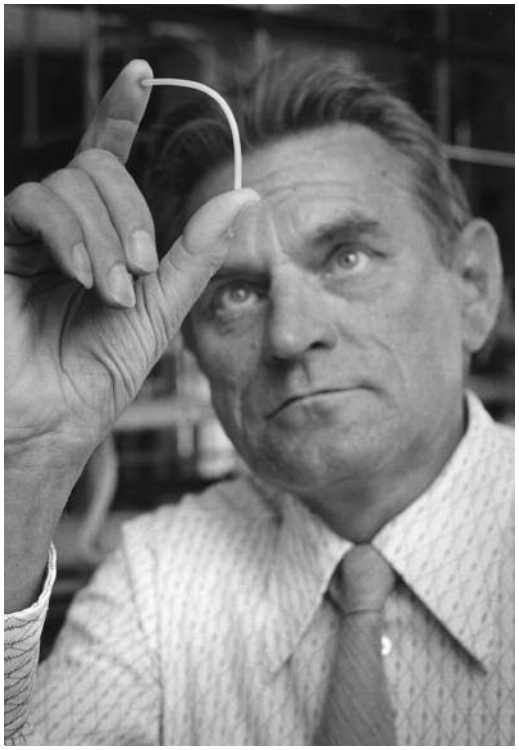
Cox's team was highly sought-after, and her well-established reputation and consulting relationships with many corporations and government agencies promised a steady flow of contract business. Indeed, all but two of RTI's first 20 research contracts were in statistics, including the institute's first education project, a survey of Raleigh residents about their attitudes toward public education; its first private-sector contract, a small feasibility study for Union Carbide Nuclear; and its first international project, an appraisal of the Nigerian government's data analysis for an agricultural census.

The other important event—Herbert called it pivotal—giving strong legs to RTI was a $2.5 million grant from the Camille and Henry Dreyfus Foundation to support a ten-year program of basic research in polymer physics and chemistry, representing the institute's second field of contract research. RTI would operate the first laboratory in America devoted solely to fundamental research in the science of polymers—compounds, such as plastics, formed by the joining of smaller, usually repeating, molecular units. The grant earmarked $500,000 for a building and laboratory, $200,000 for equipment, and the remainder for support of the polymers program.

There was a small hitch. The Dreyfus Foundation stipulated that the institute hire an internationally recognized polymer scientist to lead the laboratory. Herbert spent eighteen months interviewing more than a dozen candidates in the United States and six in Europe, among the latter of whom was Anton Peterlin, Ph.D. The highly regarded Yugoslav theoretical physicist and mathematician had been a professor of physics at the University of Ljubljana. He was imprisoned during World War II by the German army, and upon his release he founded and directed the J. Stefan Institute for nuclear reactor research. Paul Gross called Peterlin's qualifications "formidable." Peterlin accepted the position and enticed other European polymer scientists to join him. They included Anton Schindler, Ph.D., who later undertook research at RTI on biodegradable capsules for the sustained release of hormonal substances in drugs. The Camille Dreyfus Laboratory began operations in the fall of 1961. "More than any other single event, [the Dreyfus grant] assured our success," Herbert said.

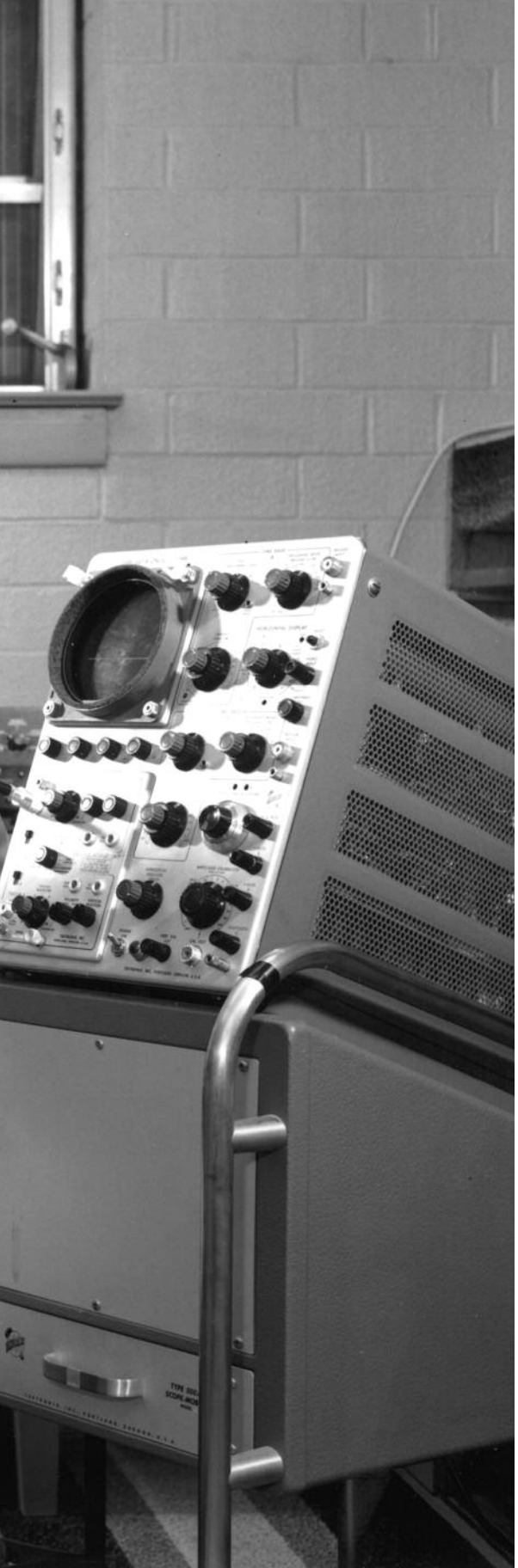
Creative Financing to the Rescue

The early years, nonetheless, were a challenge financially. Although RTI had $500,000 in startup money from private donations to carry it through three years of deficit operations, once those funds were depleted it essentially would be on its own. Chartered as a nonprofit organization with a purpose of public service rather than profit making, the institute still needed its bottom line to be in the black, with net income invested in new capital facilities and equipment. Attaining break-even—Herbert's overriding



Anton Peterlin, opposite; Anton Schindler, above; and Gertrude Cox, left, with colleague Hale C. Sweeny; were among RTI's first staff members. Peterlin, from Yugoslavia, and Schindler, an Austrian, were recruited to the new Camille Dreyfus Laboratory to conduct polymer science research. Cox, head of RTI's statistical sciences research, was the first female full professor and first female department head at then-North Carolina State College. She also was the first woman elected to the International Statistical Institute.

At RTI's Bacon Street Annex in Durham, temporary quarters as the campus awaited its first buildings, scientists studied a variety of subjects, from natural products with cancer-fighting potential to isotopes development. Here electrical engineers Charles L. "Les" Britt, left, and Carl D. Parker inspect a three-axis gyroscope with analog simulator. The year is 1963. Both scientists were still working at RTI 27 years later.



goal—would not be possible if RTI couldn't do considerably better than its first-year contract revenue of $142,000.

Building the institute's top line required successfully competing for projects against other, more established research institutes and companies. Each bid was critical, and it was up to Perkins, the institute's one-man finance department, to keep the overhead rate—expenses divided by labor—low enough to win contracts. Perkins did it by "deficit financing the startup funding," he says. "We leveraged the $500,000 to subsidize the difference between the actual overhead rate and the successful bidding rate. If the actual overhead rate was 175 percent, we might bid 75 percent. It helped us survive."

So did George Watts Hill. The powerful chairman of Durham Bank & Trust and first and longtime chairman of the institute's board of governors extended an invaluable line of credit to RTI. "George Herbert pledged our accounts receivables; this way we wouldn't have to wait 30 days to get our money," Perkins says. "I'd literally take our invoices to the bank at the end of the month, and they'd give us the cash on the spot."

Operating expenses were conserved by the institute's close association with its parent universities, which provided faculty consultants and much-needed equipment. "When we needed the university's scientists on a project, we could get them on a part-time basis, which saved money, and we could use equipment they owned, like electron microscopes, that we couldn't yet afford to buy," Perkins explains.

Cobbling Together Buildings and Staff

The universities also guided research projects to the institute. Aware that the Atomic Energy Commission (AEC) planned to fund the development of radioisotope applications centers to serve industry, Arthur C. Menius Jr., Ph.D., head of the physics department at NC State, proposed RTI as a location. Menius had enjoyed a long scientific association with the AEC. In his written proposal, he touted the institute's multi-institutional resources. The three universities, he wrote, "can offer what one institution finds most difficult—the engineering and industrial knowledge supported by research and advanced concepts nurtured in an academic atmosphere … tempered by close cooperation in a small geographic area."

In March 1959, the AEC announced a $160,000 agreement to establish an isotopes development laboratory at RTI. The facility would be headed by Ralph Ely Jr., Ph.D., a nuclear scientist who had been engaged in research for the AEC. Since a structure to house

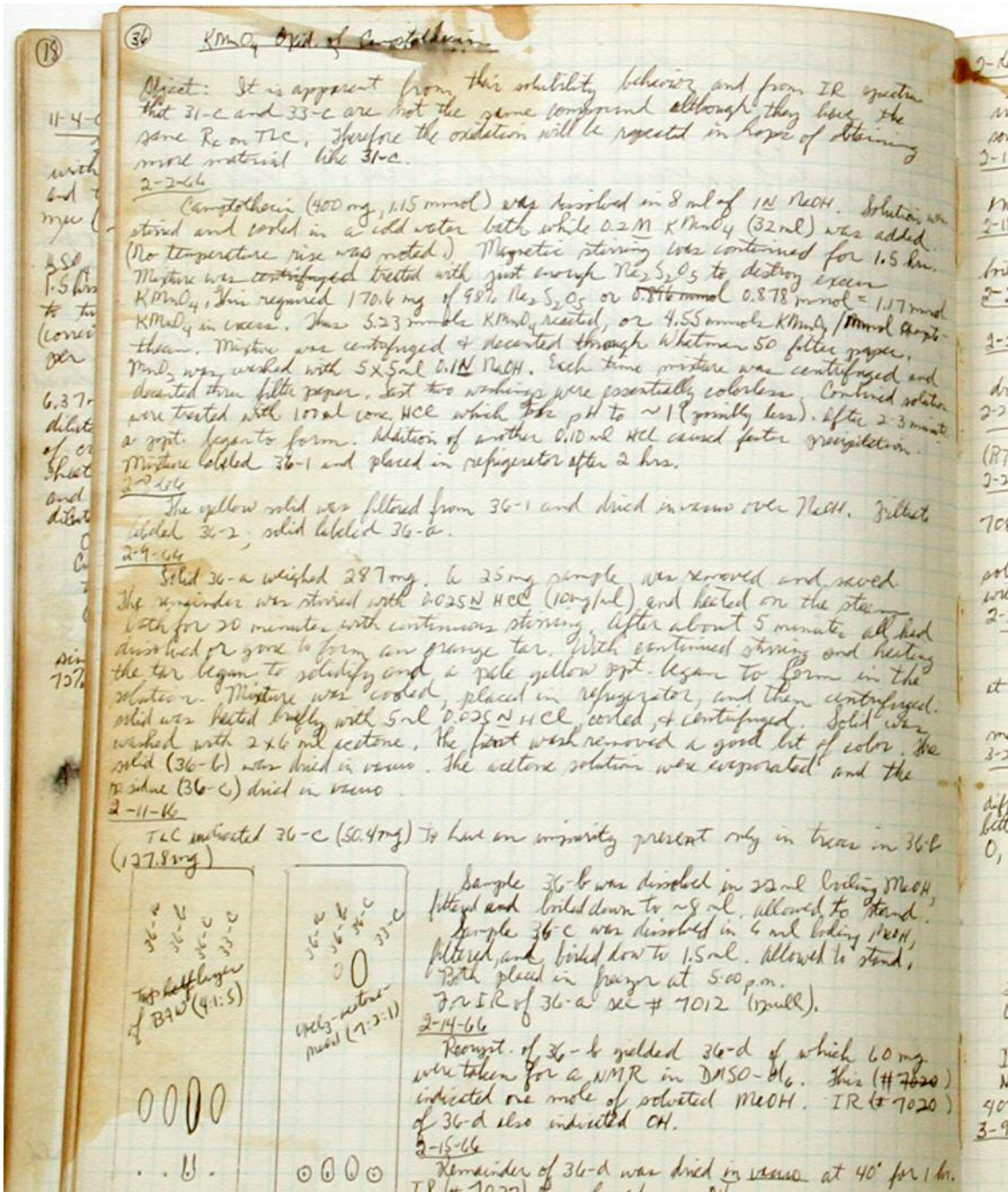
Herbert's strategy was to locate recognized scientists with stature in particular research disciplines, persuade them to join the institute, and then leverage their renown to lure additional staff.

the laboratory was yet to be built, the institute leased a 10,000-square-foot building at 807 Bacon Street in Durham as temporary quarters. The staff dubbed it the Bacon Street Annex. "It was in a distressed part of Durham, and we were able to get a very favorable rate on it," Perkins recalls. "We modified it into a laboratory at much less expense than if we had had to build it from scratch."

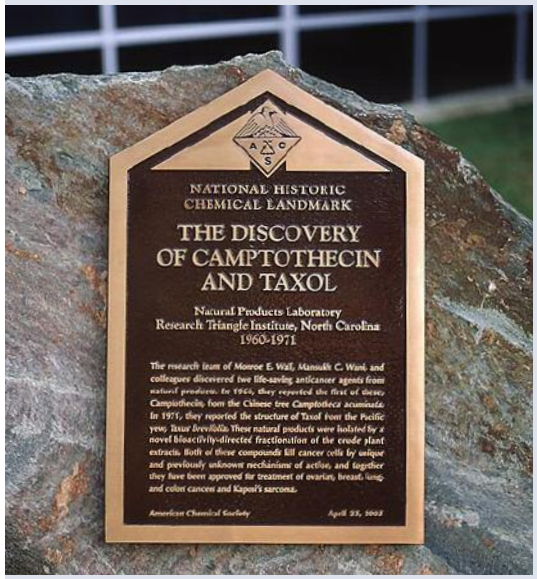
Other new research fields emerged. Herbert's strategy was to locate recognized scientists with stature in particular research disciplines, persuade them to join the institute, and then leverage their renown to lure additional staff. Research contracts would hopefully follow. As he told *North Carolina* magazine, "We built RTI from the top down, first hiring key people who could assemble top-notch staffs and establish high-quality research programs in their respective fields."

Monroe E. Wall, Ph.D., fit this model. Head of the plant steroid section at the U.S. Department of Agriculture's Eastern Regional Research Laboratory, Wall had conducted extensive screening of plant samples to discern chemical substances that could be converted into cortisone to treat arthritis. Wall also supplied the National Cancer Institute (NCI) with plant samples for possible cancer treatments, but when NCI requested more samples, his superiors demurred. The National Institutes of Health (NIH), which was interested in sponsoring applied research in cancer chemotherapy, learned of Wall's disappointment and offered to support his research under contract, assuming he would leave his employ at the U.S. Department of Agriculture (USDA), assemble a staff, and find a laboratory. RTI had lab space available at the Bacon Street

The discovery of Taxol and camptothecin at RTI by the late Monroe E. Wall, opposite, and Mansukh Wani revolutionized modern cancer research. The compounds, both derived from plants at RTI in the 1960s and 1970s, are among today's frontline drugs in the fight against cancer. This page from the researchers' notebook describes camptothecin tests.



Fighting Cancer: Hard Work Yields Miracle Drugs



For almost its entire history, RTI has been at the forefront of scientific advances in the hunt for effective chemotherapy agents. Since the beginning of RTI's Natural Products Laboratory in 1960, thousands of plants, fungi and other natural products have been tested for anticancer properties—work that continues today. Of these, two lifesaving compounds for the treatment of cancer have been discovered and successfully tested in animals and humans, received U.S. Food and Drug Administration approval and are now on the market.

The first was camptothecin, which was isolated in 1965 by Monroe Wall, Mansukh Wani and colleagues. After months of conscientious lab work, they found that an alkaloid extracted from the leaves of the *Camptotheca acuminata* tree native to China yielded a high degree of reproducible potency against mouse leukemia L-1210. In June 1966 at the annual meeting of the International Union of Pure and Applied Chemistry, Wall published the findings, calling the compound camptothecin. While camptothecin did not cure leukemia, cancer-stricken animals that received it lived longer than those that did not.

Wani was instrumental in characterizing the compound's molecular structure. "Camptothecin was a very complex molecule, so complex that only nature could make it. I was able to prepare a crystalline derivative and then worked with scientists at the University of Illinois at Urbana who had expertise in X-ray crystallography. We were able to determine the structure and then we published our paper in the *Journal of the American Chemical Society* in 1966. It was a landmark."

As clinical trials of camptothecin in humans began in the early 1970s, RTI was buoyed by an announcement by the National Cancer Institute that camptothecin "stands front stage center" in the search for drugs inhibiting tumors causing colon and rectal cancer. Unfortunately, it was a premature assessment. As Wani remembers, an oncologist at the Mayo Clinic, Charles Moertel, MD, thought that camptothecin "seemed to show promise in some cancers like cancer of the stomach. But, after [Moertel] used it on 61 patients, he changed his mind and said that camptothecin was a compound of unpredictable toxicity and had no clinical value at all in the treatment of gastrointestinal cancers."

Moertel presented his findings at the annual meeting of the American Association for Cancer Research in 1971. "He put things in a very Shakespearean way," Wani recalls, "saying 'I have come here not to praise camptothecin but to bury it.'" Further clinical trials were halted immediately.

A breakthrough came more than fifteen years later. Although dismayed by camptothecin's failure to treat gastrointestinal cancer, the Natural Products Laboratory pressed on, synthesizing more than 60 analogues by 1989. That year, *Science* magazine reported that one of the analogues caused total tumor regression and long-term survival of immunodeficient mice carrying human colon cancer cell lines. All but one of 50 mice implanted with the tumors showed a complete remission. Unlike previous analogues, the new one had low toxicity and produced fewer adverse side effects. "If we had abandoned camptothecin when the initial clinical trials showed it to be toxic, we never would have discovered the more promising camptothecin analogues," Wani says.

The Natural Products Laboratory and researchers elsewhere continued to refine camptothecin for improved anticancer activities. In 1997, under an agreement with Bristol-Myers Squibb, RTI began synthesizing third-generation camptothecin analogues, which offered greater potential for antitumor activity with decreased toxicity. Today, Pfizer and GlaxoSmithKline market the chemotherapy agent as Camptosar and Hycamtin, respectively, for the treatment of ovarian and colon cancers.

Wall, Wani, and their colleagues isolated the second compound, taxol, after samples of *Taxus brevifolia*, a yew tree indigenous to the Pacific Northwest, which had been sent to the lab in the 1960s, showed promise. "We tested hundreds of fractions from the tree and isolated one compound in the tree bark that generated anticancer activity," Wani recalls.

Twelve kilos of the tree's bark were shipped to the lab, which undertook a process called bioassay-directed fractionation to isolate the most active compound. Wani, meanwhile, was tasked with determining the structure

of the compound. Taxol was extremely large from a molecular standpoint, creating stiff challenges. "Dr. Wall knew I was struggling with determining the structure of the molecule and had not made any progress over the past two years," Wani says. "He told me to forget about taxol. I asked if I could continue on it as a low priority. He agreed, and I began to work on it in the evenings and on weekends."

In 1970, the molecule finally yielded its structure. The following year, the lab published a paper asserting that taxol showed high experimental activity as an anticancer agent. Promising as this was, its supply was constrained by the endangered status of *Taxus brevifolia*. "It would have taken all the Pacific yew trees left to treat five patients," RTI board member William Little, Ph.D., says, only half-jokingly. Synthesizing taxol in the lab would solve the supply constraints, but the molecule's complex structure stood in the way. "For these reasons, NCI said it wasn't interested in pursuing taxol—even if it was a miracle drug," Wani says. "For the next four years, it was on the shelf dying a dusty death."

Scientists outside RTI built upon the institute's pioneering research, and interest in taxol was revived in the 1980s after it was discovered that the compound attacked cancer in an unprecedented way. Researchers at Florida State University invented a method for mass-producing taxol. By the 1990s, taxol had received an excellent evaluation based on Phase I and Phase II clinical trials involving patients with ovarian cancer.

Taxol successfully emerged from Phase III clinical trials conducted by Bristol-Myers Squibb, persuading the FDA to approve its use for refractory ovarian cancer in 1992. Bristol-Myers Squibb now markets the chemotherapy agent as Taxol. In 1996, FDA approved a second-generation analogue of taxol, docetaxel, synthesized by French scientists.

Nicholas Oberlies, Ph.D., director of RTI's Natural Products Laboratory, estimates that the current combined market value of the camptothecins, Taxol, and docetaxel is more than $3 billion per year.

The American Chemical Society celebrated the discovery of taxol and camptothecin by designating RTI a National Historic Chemical Landmark. A plaque, opposite, in front of the William F. Little medicinal chemistry building describes the discoveries. Above are the raw materials of Taxol, left, in drug form, and camptothecin.

Annex; nearby was Duke University's department of biochemistry and medical school. A May 1960 agreement called for Wall to head up RTI's new Natural Products Laboratory, where his research was funded by NCI.

The esteemed scientist gradually put together a staff of chemists. They included Ivy Carroll, Ph.D., whose work included the use of molecular modeling techniques to design compounds for biological applications like analgesics, depressants, and stimulants; Edgar Cook, Ph.D., an expert in steroid and flavonoid synthesis, drug metabolism, and anti-fertility compounds; and Mansukh C. Wani, Ph.D., whose doctoral thesis at Indiana University explored the use of natural compounds to counteract the effects of radiation. Within just a few years, their collective work—the discovery and later commercialization of two powerful anti-cancer compounds, taxol and camptothecin—would garner the world's attention.

Build It and They Will Come

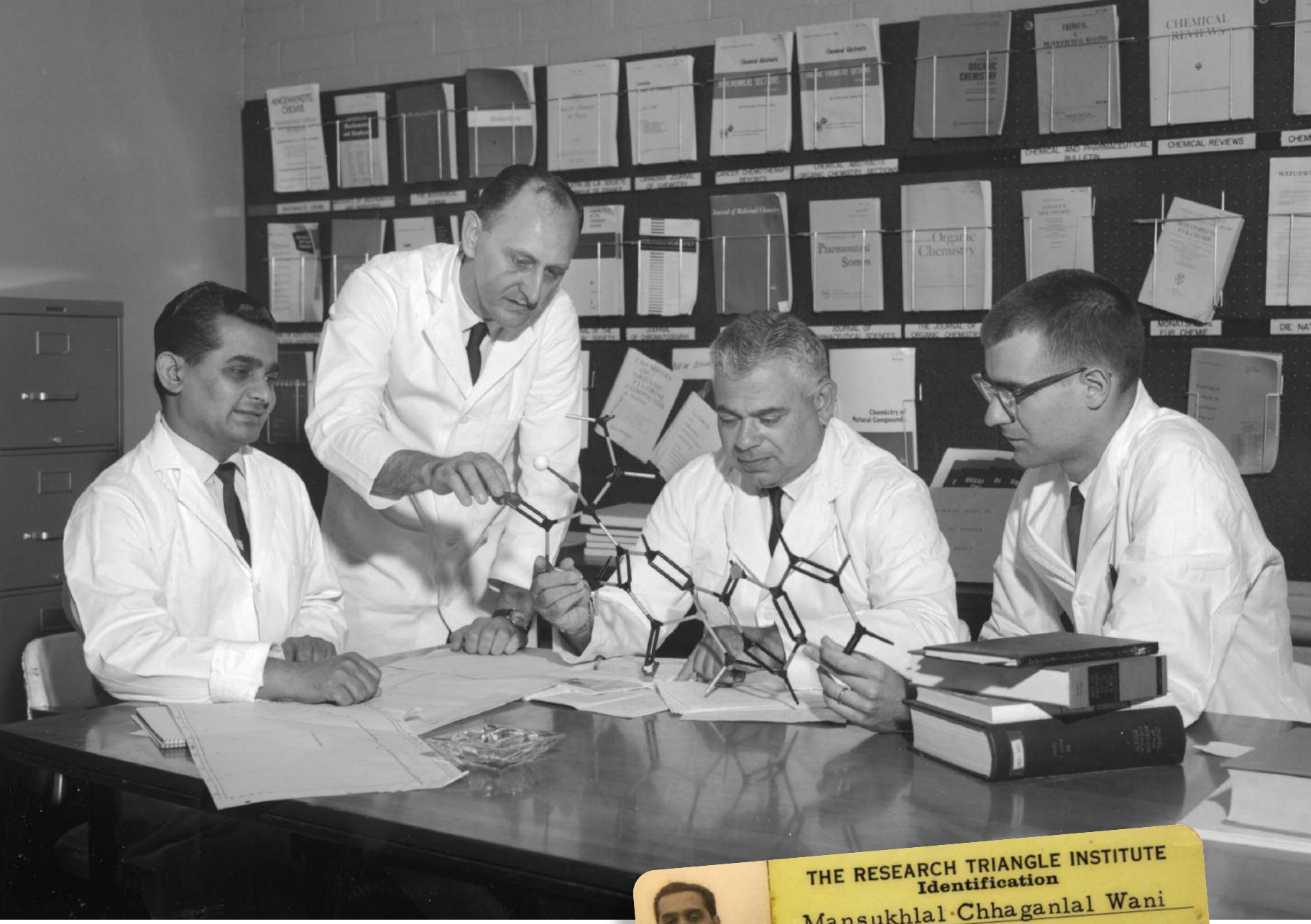
RTI could now tout four chief areas of contract research—statistics, polymers, radioisotopes, and natural products chemistry. Although the $500,000 in startup money had been exhausted by 1962, the institute tallied more than $1.4 million in research revenue that year to reach breakeven. Confident of a bright future for RTI, Governor Hodges included a line item of $200,000 in the state's budget for laboratory equipment at the institute. The gesture set a precedent that was duplicated by his successor, Governor Terry Sanford, who earmarked $300,000 toward additional equipment and instruments in 1963. Four years later, Governor Dan Moore followed suit with $200,000. By 1969, the state had invested $860,000 in its homegrown research institute.

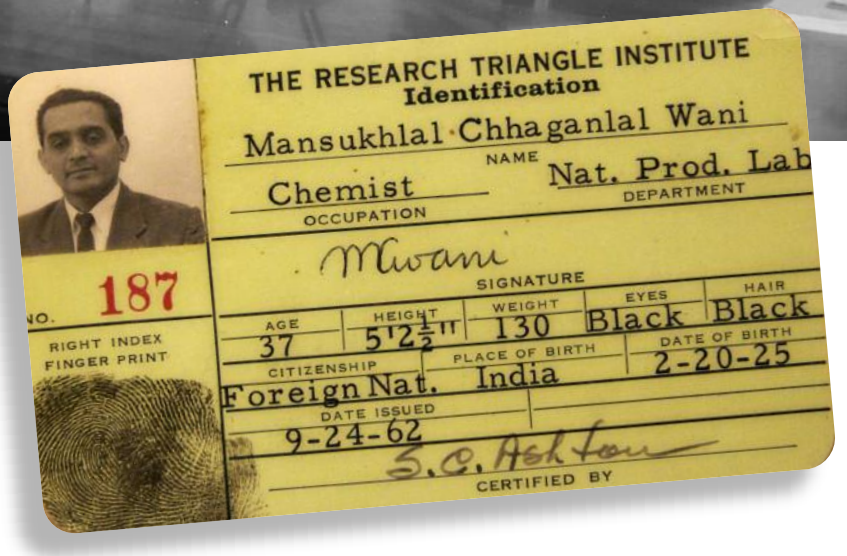
Cox and Finkner became full-time employees in 1962. The statistics staff moved into the new Robert Hanes Memorial Building, as did Herbert, Perkins, Treasurer Samuel Ashton, and other administrators, plus the three-person Research Triangle Foundation, whose mission was to attract more residents to the park. The first was Chemstrand Corporation, a maker of chemical fibers that purchased a 105-acre site for a corporate research center and laboratory. Other than the Hanes and Chemstrand buildings, the only structures in the park were remnants of old farms.

Gradually, other buildings dotted the park. In 1961, Grover M. Hermann, chairman of the Martin Marietta Corporation, pledged $100,000 toward a 20,000-square-foot laboratory named for the late William Trent Ragland. Ragland was the former president of a Marietta subsidiary, Superior Stone, which donated another $51,000 toward the building. Hermann joined the board of governors and made other bequests to the institute over the years, including a $60,000 Bunker Ramo computer nicknamed "Bunky" by statisticians. In 1967, to alleviate overcrowding at the Bacon Street Annex, he donated $335,000 toward a new chemistry and life sciences building, named in his honor upon its completion in 1971.

The park soon became the home of buildings housing the small U.S. Forestry Services and the huge National Institute of Environmental Health Sciences, built in 1962 and 1965, respectively. The North Carolina Board of Science and Technology and the American Association of Textile Chemists and Colorists moved into separate park structures in 1965. That same year, the park's best-known corporate resident—IBM Corporation—purchased 420 acres and announced plans to build a major research and development, manufacturing, and engineering facility.

Alva Finkner came to RTI from NC State University as part of a statistical science team that also brought Gertrude Cox to RTI.





The successful results of preliminary tests of camptothecin as an anti-cancer agent were reported at the 1966 annual meeting of the International Union of Pure and Applied Chemistry. Pictured left to right are M.C. Wani, Keith H. Palmer, Monroe E. Wall, and C. Edgar Cook. At right is Wani's 1962 RTI badge.

Parade of New Clients

All the while, RTI buzzed with activity. The Bacon Street Annex was occupied by Ely's and Wall's research teams, conducting work for the Atomic Energy Commission and the National Cancer Institute. The Dreyfus Laboratory also performed research for AEC as well as USDA, the National Aeronautics and Space Administration (NASA), and local clients like the North Carolina Textile Manufacturers Association. Bolstering the laboratory's work was a $1 million grant from Celanese Corporation to support five years of unrestricted research in polymer science.

The statistics group completed two reliability studies for Bell Laboratories, and for NASA it developed statistical methods to evaluate the dependability of the digital logic systems guiding Nike missiles. Research in other reliability-related programs, such as spacecraft launch safety, environmental quality assurance, and airborne navigational aids, quickly followed. The statistics group also undertook a four-year USAID project supervising a rural economics and agricultural statistics survey in Nigeria, marking the onset of RTI's long relationship with that government agency. New hires in the statistics group included Daniel G. Horvitz, Ph.D., Cox and Finkner's former colleague at NC State. Horvitz had just completed a Ford Foundation teaching program in statistics and agricultural economics at the University of Rangoon in Burma.

The Cold War offered new research opportunities. Civil defense research became a national priority following the shooting down of an American U-2 reconnaissance plane over the Soviet Union and the shocking revelations of shipments of Soviet missiles to Cuba. RTI formed an Operations Research and Economics Division that garnered research contracts from the federal Office of Civil Defense (OCD). Through the 1960s, the division undertook approximately 60 research projects for OCD, the U.S. Public Health Service, the Federal Power Commission, and other government agencies. Projects ranged from fallout shelter analyses to nuclear casualty estimation models. By the end of the decade, civil defense research represented the largest volume of projects in a single category. This work leveraged the institute's interdisciplinary research: more than 50 staff members with 108 degrees in 47 subject fields, from aeronautical engineering to zoology, contributed to these projects.

Another burgeoning research area was microelectronics. With assistance from Duke University's electrical engineering department, RTI wrote a proposal to Corning Glass Works to conduct research on thin-film capacitor technology. The project was approved in 1962 and supervised by Robert M. Burger, Ph.D., a physicist and electrical engineer from Westinghouse who joined the institute to lead its first solid-state laboratory. That lab was at the forefront of the revolutionary development of integrated circuitry—complex circuits etched onto tiny chips of semiconductor material, such as silicon. Burger and his colleagues in 1967 published *Fundamentals of Silicon Integrated Device Technology*, which became a standard reference in the field.

The Environmental Movement and the War on Poverty

Events affecting humankind propelled other research endeavors in the mid-1960s, a period of great social upheaval in the country. Following the 1962 publication of Rachel Carson's *Silent Spring*, a book documenting the detrimental effects of pesticides on the natural world, the environmental movement was born. Public concerns also were raised about the state of the country's education and health care. RTI heeded the call with its initial forays into quality-of-life

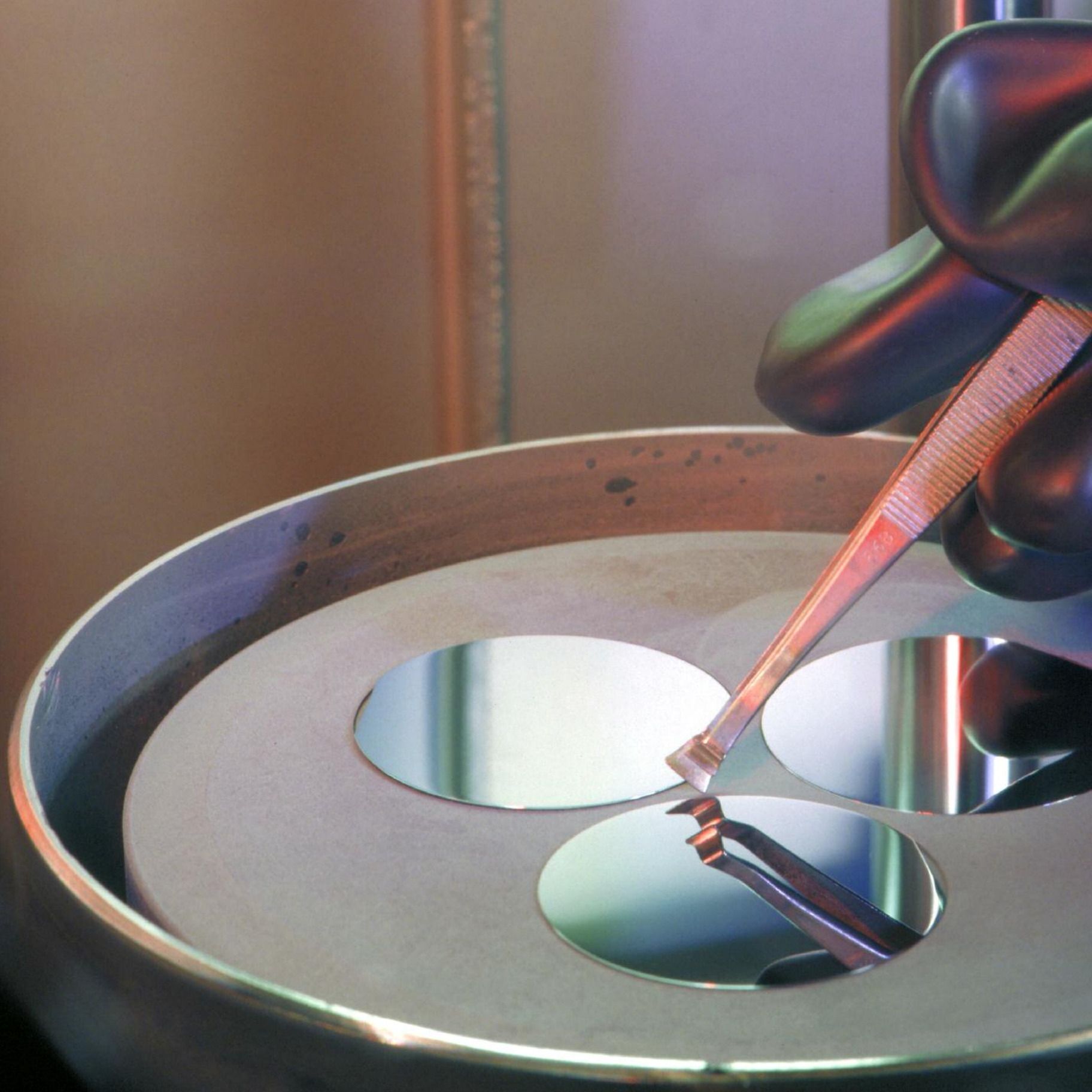
A grant from the Camille and Henry Dreyfus Foundation funded construction of the Dreyfus Laboratory, opposite in 1961, which was dedicated to polymer research. A 20,000-square-foot addition to Dreyfus Laboratory's hollow square was completed in 1978. At right, RTI board chairman George Watts Hill's first annual luncheon for ten-year staff members included, left to right, George R. Herbert, Lewis H. Ballard, William H. Perkins Jr., Ralph Ely Jr., W. J. Thomas, Harold M. Richter, Samuel C. Ashton, Maxine Bondy, Hill, and Gertrude M. Cox.

research. RTI hired staff to conduct research in these areas, with the expectation that, over time, clients would be cultivated, proposals would be accepted, and contract revenue would follow.

Following President Lyndon B. Johnson's declared War on Poverty, a legislative agenda in response to the nation's alarming poverty rate of 19 percent, the institute offered its resources in survey research and social sciences. Congress passed the Economic Opportunity Act, a law establishing the Office of Economic Opportunity (OEO) to administer federal funds easing poverty conditions. The OEO funded such Great Society programs as Job Corps training for high-school dropouts, Head Start for underprivileged preschoolers, Upward Bound for disadvantaged high-school students, and the North Carolina Fund, the first of many projects evaluating the effectiveness of major social programs.

Survey capabilities were augmented by the creation of the Triangle Universities Computation Center (TUCC) in the park by RTI and its three parent universities in 1965. The computing facility was a boon to survey specialists and data analysts and a big upgrade over Bunky, the computer in the basement of the Ragland Building. "Bunky was designed for online production data, not scientific data processing," Horvitz explains. "The universities provided resources that we couldn't possibly provide on our own." TUCC was shared by the universities and RTI, which paid fees on a usage basis.

The universities' close relationship with RTI was everything its founders had hoped for. Researchers drew from the universities' libraries, and staff members enrolled in university courses and received appointments as faculty to teach and supervise graduate study. They also coauthored papers and books with their university counterparts. "From the time of RTI's inception, it was recognized that the presence of the universities here in the Triangle area would be the institute's greatest asset," wrote Marcus E. Hobbs, Ph.D., a chemistry professor at Duke University who became chairman of RTI's executive committee in 1962. "[This] has been confirmed with each passing year."



CHAPTER THREE

A Boom in Quality-of-Life Research

Various forms of quality-of-life research became core disciplines for RTI in the 1970s, fueling the institute's growth along with its contributions to society in such areas as the environment, renewable energy, education, and health care. These concerns also became more global during the 1970s, as RTI continued to stretch its wings across the planet. Key RTI projects included collecting and analyzing environmental pollutants and, opposite, in cooperation with NC State, development of the world's first monolithic cascade solar cell.


GRADES
9- (2-5)
SCHEDULE +
CONFIRMATION MEMOS
FOR GREENVILLE.
1. SIZE?
2. SHAPE?
3. MADE OF?
4. USED FOR?

The National Assessment of Educational Progress, a survey measuring the quality of American education, made RTI a leader in education research and inspired many other education studies in succeeding decades. William C. Eckerman, center in inset photo, was the initial project leader. James R. Chromy, left, succeeded him. Also in the 1969 photo is William K. Grogan, NAEP field survey operations manager. Opposite, RTI survey staff members Donn Smith, Nancy Monroe, and Mimi Holt demonstrate materials used in NAEP demonstration exercises.

By 1966, RTI's annual revenues had grown to $4.2 million, and the staff reached nearly 300 people. They had become a close-knit group despite their varied areas of expertise. "Everyone knew everyone else, which helped when we needed to collaborate on an interdisciplinary basis," says James Chromy, Ph.D., who joined the statistics division in 1966. "We had a softball league, which is how I got to know the guys from the Solid State Laboratory." A cafeteria built within the institute's fifth on-campus structure contributed to the camaraderie. Previously, most of the staff brown-bagged it, since the closest place to eat off-campus was halfway to Durham. To encourage institute scientists to exchange ideas and learn more about each other's research areas, a program of lunchtime seminars was launched in the cafeteria.

Spirits were high that year as RTI received a major research contract from the U.S. Department of Education. The National Assessment of Educational Progress (NAEP) was a federal project measuring the quality of American education and students' achievement in science, math, reading, social studies, and writing. The plan was to measure a cross-section of nine-, 13-, and 17-year-olds, as well as young adults ages 26 to 35. An exploratory NAEP technical advisory committee chaired by John Tukey, Ph.D., from Princeton University called on Gertrude Cox to help develop the survey methodology. "John wanted advice from someone with a strong background in sampling design and data collection, and Gertrude certainly fit the bill," Dan Horvitz explains.

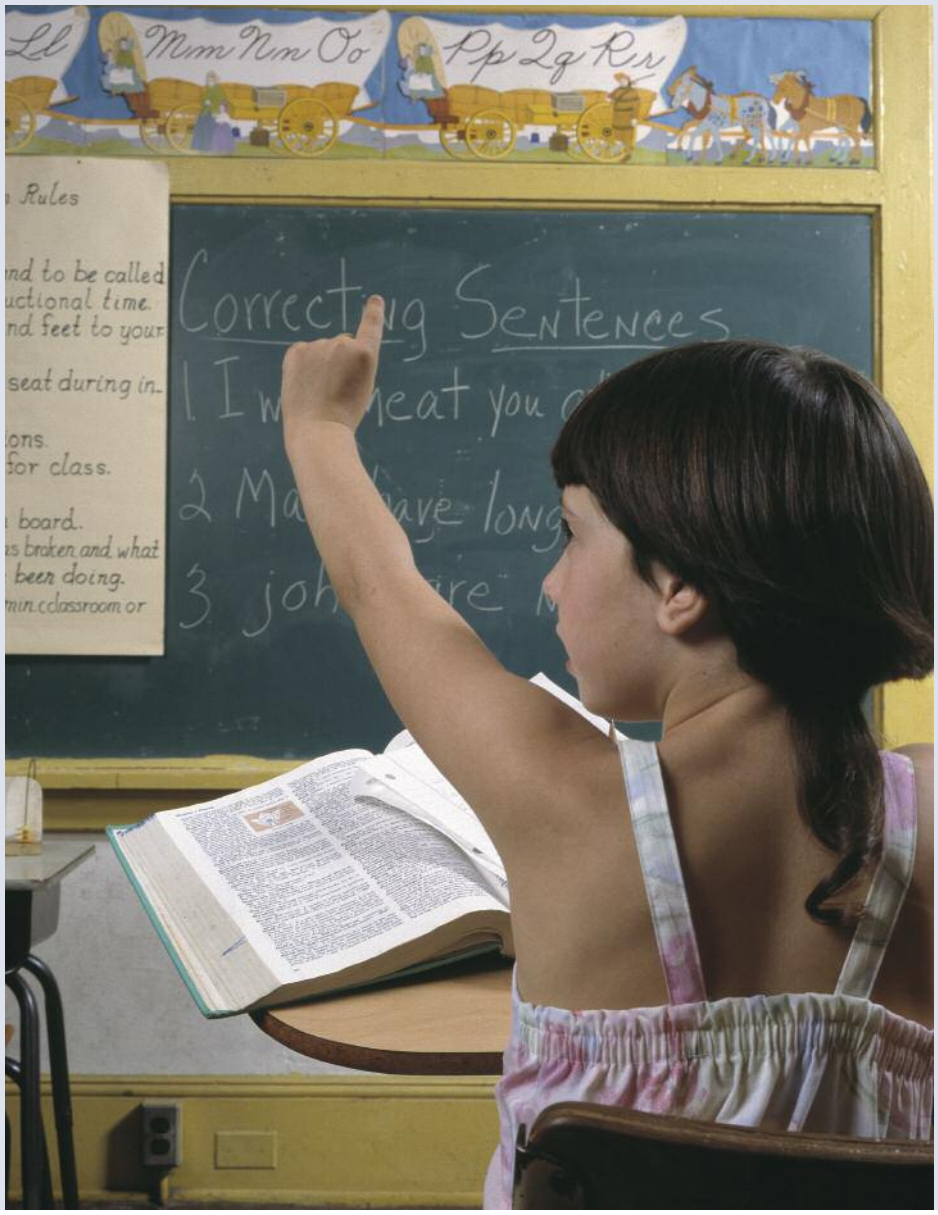
The Nation's Report Card

The government initially retained RTI to design the NAEP's sampling procedures and administration tools for in-school and out-of-school assessments and to define the methods to analyze the data. RTI then won a contract to conduct and administer the initial NAEP survey in 1969—its first national survey. "We did the sampling, and Measurement Research Center in Iowa City did the test booklet scoring," Chromy recalls. "When the data were published in 1970–71, it was a highly publicized event."

Its success with the first NAEP survey (the study today is called the Nation's Report Card) generated similar state assessments for the institute, beginning with Minnesota and spreading to nine other states over the next 20 years. "It was a constant stream of work on an ever-larger scale that required a significant enlargement of our staff in different cities around the country," says Horvitz.

Many new staff members were social scientists like William Eckerman, Ph.D., hired by Alva

An Eye on the U.S. Classroom



RTI's expertise in statistical sciences and survey sampling has put it in good stead to help the government assess the state of learning in America, with the result that domestic education has been one of the largest and most important areas of research for RTI for almost four decades.

RTI's first national education study was the National Assessment of Educational Progress, commissioned by the U.S. Department of Education in 1969 to measure the achievements of cross-sections of students between the ages of nine and 17, plus young adults as old as 35, in five key subjects. Success with that project led, in 1973, to a contract with the National Center for Education Statistics (NCES) to conduct the National Longitudinal Study (NLS:72), a study of 23,000 members of the high-school class of 1972. From 1973 through 1980, RTI conducted four follow-ups of NLS:72, which NCES later described as "probably the richest archive ever assembled on a single generation of Americans."

Since that time, RTI has conducted many large-scale and high-profile surveys of students and other stakeholders in American early childhood, elementary, secondary, and postsecondary education—providing educators, government analysts, and others with a wealth of data with which to evaluate the effectiveness of programs and make policy.

NCES has sponsored a number of other high-school longitudinal studies since the late 1980s, several conducted by RTI. The National Education Longitudinal Study of 1988 (NELS:88) intended to provide trend data on the critical transitions in students' lives as they move

For nearly four decades, RTI has worked to ensure that the U.S. educational system prepares children to develop satisfying careers and contribute to society, regardless of race, gender and ethnicity, geographic locale, and socioeconomic factors.

from middle school into high school and then to postsecondary education, the workforce, and even into starting families. The initial survey asked a national sample of more than 24,000 eighth-graders about school, work, and home experiences; educational resources and support; parents' and peers' roles in their education; neighborhood characteristics; educational and occupational aspirations; smoking, alcohol, and drug use; and other issues. Teachers, parents, and school administrators also were interviewed, and some coursework, grades, and postsecondary transcripts were made part of the dataset. Follow-up surveys were done in 1990, 1992, 1994, and 2000—with RTI conducting the 2000 survey—generating valuable data on student learning and achievement, drop-out rates and predictors, the effects of students' access to certain programs and equal learning opportunities, postsecondary access and choice, and employment.

Building upon NLS:72 and NELS:88, RTI was contracted to conduct the Education Longitudinal Study of 2002, which monitors the transition of American youth as they move from tenth grade through high school, and then to postsecondary education and work. In this study, interviews were conducted not only with students, parents, teachers and school administrators but also with library media center directors. Follow-up surveys were done in 2004 and 2006; additional follow-ups are contemplated. As NCES writes on its Web site, these data make it possible "to record the changes taking place in [students'] lives and help to explain these changes—that is, understand the ways in which earlier achievements, aspirations, and experience influence what happens to them later."

RTI also has been working with NCES for more than 20 years to collect data on the nation's postsecondary education system, with a focus on issues of access, choice, persistence, and attainment. The National Postsecondary Student Aid Study (NPSAS), a large-scale survey of students attending all types of postsecondary institutions, has been conducted every three or four years since 1986 to determine how students and their families pay for education beyond high school and to address policy questions resulting from the rapid growth and change in financial aid programs and policies. Six surveys have been conducted, the last four by RTI. Each has involved a sample of between 80,000 and 140,000 students from more than 1,500 postsecondary institutions—providing information on college costs, the distribution of financial aid, and demographic and other characteristics of aided and non-aided students and their families. The (NPSAS) surveys have generated two spinoff longitudinal studies, also conducted periodically by RTI.

RTI has been working with NCES for almost ten years to gather and publish data on the nation's colleges, universities, and other postsecondary institutions. Under the Integrated Postsecondary Education Data System (IPEDS) project, RTI assembled and has continued to update the most comprehensive database available of 7,000 U.S. postsecondary institutions.

John Riccobono, Ph.D., vice president of RTI's Education Studies Division, considers the IPEDS database, known as College Navigator, as "the first place a student or parent should go before deciding what institutions to put on the short list." IPEDS provides everything from the name, address, and telephone number of an institution to its calendar, enrollment, admission requirements, demographic information for every degree program, staffing levels, faculty salaries, tuition costs and other fees, institutional revenues and expenses, endowment, financial aid history, and graduation rates.

Naturally, gathering this amount of data from hundreds of thousands of sources and making sense of it requires a capability that few research institutions can offer—and RTI has won many first-time contracts in domestic education because of its large-scale data collection capability, statistical design and sampling expertise, innovative programming, and computing and data processing capacity. But, as Riccobono says, "You don't get more work if you don't do a good job," and he points to RTI's ability to innovate as the primary reason for its endurance with clients like NCES. For example, he says, RTI has made significant changes in the systems and processes used for NCES projects over the years; these have reduced the burden on institutions and other study participants, improved survey response rates, made data collection and processing more efficient, and enhanced the quality of the data.

"Our clients want to see that we've learned something every time we conduct a project and that the knowledge will improve a study the next time it's conducted," he says. "We're proud of having done that."

Finkner, who had succeeded Cox. Tom Virag, an elementary-school principal in Pennsylvania, was another new hire. "I saw an ad in the Pittsburgh paper that RTI was hiring a national management team in connection with NAEP," says Virag. "I applied, got the job, and was made a district supervisor, managing the sampling units in central and western Pennsylvania." Six months later, Virag accepted an offer from Finkner to manage NAEP sampling units in the eastern United States, which required relocation to North Carolina. He eventually became national field director of the NAEP project and later led RTI's largest-ever survey, the National Survey on Drug Use and Health.

Winning the various state projects and the ongoing NAEP contracts put RTI in the forefront of U.S. education research. Contract research from other education and social science initiatives emerged, generating wide recognition of the institute as one of the world's preeminent survey methodology and research organizations. This work also defined RTI's growing reputation for quality-of-life research. While 21 percent of RTI's revenues derived from research in education, health, transportation, population, and the environment in 1966, three years later, those areas accounted for 65 percent of revenue.

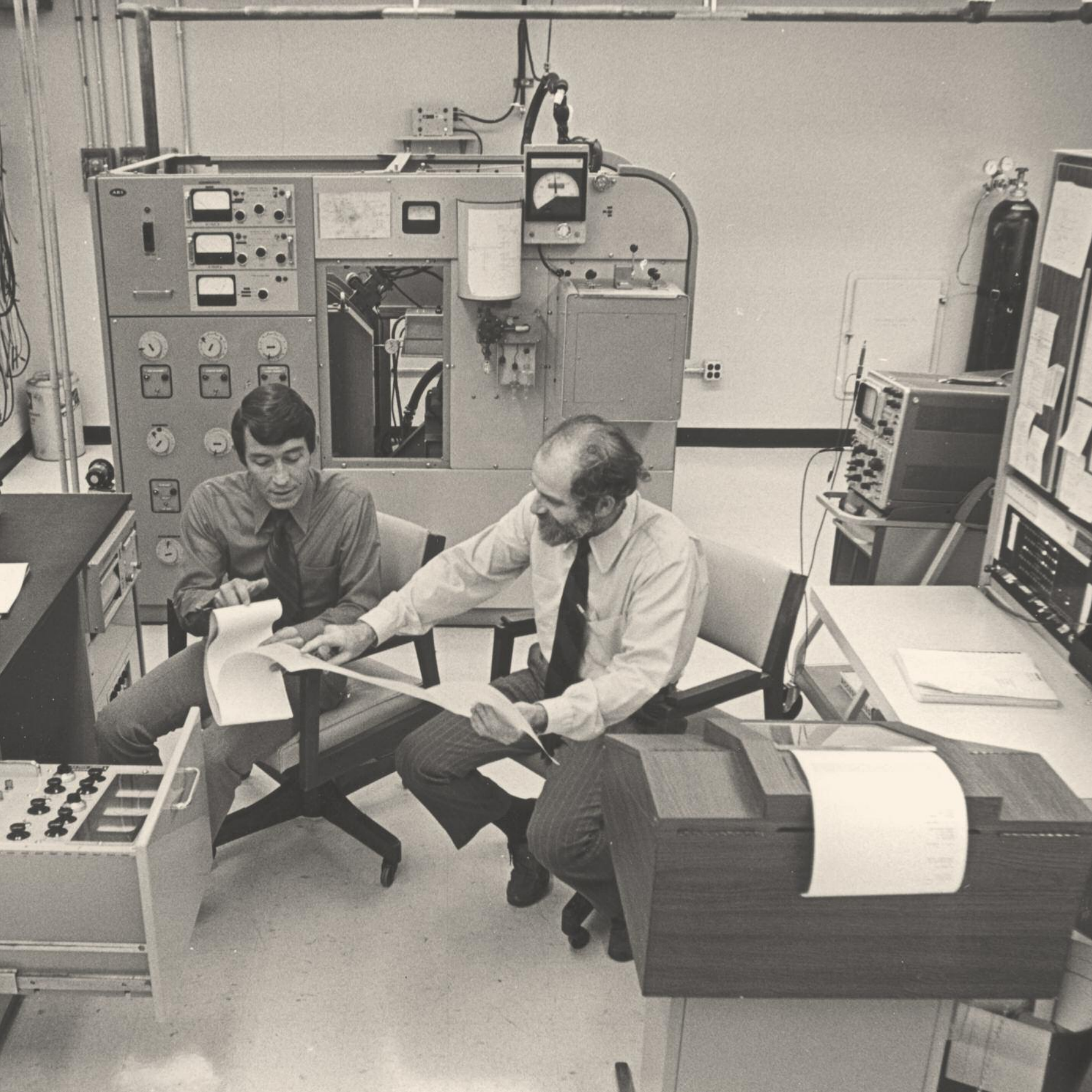
Big Machine for Small Work

There was much to cheer at the Bacon Street Annex when a 7,000-pound, high-resolution mass spectrometer tailored to the needs of the Natural Products Laboratory was delivered in 1967. Chemists were in the thick of research on hormone synthesis, steroid and drug metabolism, and tumor inhibitors like camptothecin. This new device, which measured the mass of particles, ions, and isotopes with unprecedented accuracy, was a boon to their work. "It gave chemists the ability to take a sample of camptothecin that weighed not much more than a name on a piece of paper and determine its organic structure in the smallest amounts," explains Bill Little, a chemistry professor at UNC at the time and Marcus Hobbs' successor as chairman of the institute's executive committee.

UNC, NC State, and Duke played pivotal roles in the mass spectrometer's acquisition, which cost more than the institute could afford

RTI and its university partners submitted a joint application to the National Institutes of Health for a grant to buy the equipment. They won it, as well as a ten-year NIH operating grant to become a regional mass spectrometry center, one of a handful in the country and the only one in the South.

RTI's first mass spectrometer allowed researchers to measure masses of particles, ions, and isotopes. David W. Rosenthal, right, managed the Research Triangle Regional Mass Spectrometry Center and described the machine as the "Supreme Court of small amounts." With him is technician Fred P. Williams.



Substance abuse and environmental pollution have long been subjects of RTI research. Since the 1960s, RTI has studied drug and alcohol abuse, from its possible causes to its cost, chemistry, treatment, epidemiology, and the effectiveness of prevention programs. This work addresses a wide range of illegal substances, including heroin, cocaine, and marijuana—which RTI technicians, right, have processed since the 1970s for scientific study. Since the first days of the environmental movement, RTI also has been evaluating air pollution, exemplified, opposite, by a cloud of smog over Santiago, Chile.

on its own. The four organizations submitted a joint application to the National Institutes of Health for a grant to buy the equipment. They won it, as well as a ten-year NIH operating grant to become a regional mass spectrometry center, one of a handful in the country and the only one in the South. The spectrometry center also assisted the institute's burgeoning environmental studies and similarly served the needs of two Research Triangle Park residents: the National Institute of Environmental Health Sciences and the National Center for Air Pollution Control (predecessor of the Environmental Protection Agency, which was created in 1970).

Tracking Substance Abuse

Another new area of contract research emerged in 1968: substance abuse. Gathering the multidisciplinary skills of its staff, RTI studied substance abuse treatment, cost, policy, epidemiology, and chemistry. Among the projects was a 1971 contract to evaluate drug and alcohol use among recent arrestees. One of the most prominent projects culminated in the publication of *Drug Abuse Treatment: A National Study of Effectiveness*, a book positing that treatment had been successful in reducing drug abuse rates and the demand for illegal drugs. Of the book's six coau-

thors, five were from RTI, including Robert L. Hubbard, Ph.D., the principal author.

Monroe Wall's lab also undertook drug research, including developing the first chemical profile of marijuana. Researchers also evaluated marijuana's efficacy in relieving the nausea that is common with cancer chemotherapy and in treating patients afflicted with glaucoma, a cause of blindness. Funded by the National Institute on Drug Abuse (NIDA), the studies' conclusions were favorable. Newspaper reporters smelled a good story and noted that RTI, under contract to NIDA, had been making marijuana cigarettes using plants grown by the government at the University of Mississippi.

Hoopla aside, the lab's pioneering research ultimately guided more sensitive methods for detecting drugs in human tissue. The mass spectrometer played a major role in this regard, as did related scientific techniques like chromatography and radioimmunoassay. In subsequent years, the lab studied the chemistry, pharmacology, and biochemical mechanisms of other illegal drugs like heroin, cocaine, and LSD, while other research units tackled issues like drug usage rates and treatment outcomes—efforts that profoundly affected public policy.

Events Spur a Reorganization

The 1970s saw a further evolution of RTI toward more quality-of-life research. Events affecting humankind drove much of this work. For example, when air pollution stirred national outrage, the institute was contracted with to measure gases and particulates in automobile exhaust, examine the costs of controlling air pollution, and estimate the spending necessary for compliance with new legislation.

To provide the strongest base for future growth and foster more interdisciplinary research, George Herbert reorganized RTI's staff of 430 employees in 1971, creating four distinct research groups: social and economic systems, statistical sciences, environmental sciences and engineering, and chemistry and life sciences. Each entity's research vice presidents were accountable for research performance, program development, and staffing.

The institute's core competencies gradually came into sharper focus, helping generate more business. Education was a prime example. In 1971, the institute created a specific unit for this work—the Center for Education Research and Evaluation. The center's staff comprised statisticians, social psychologists, and other education specialists. That same year, the National Center for Education Statistics contracted with RTI to design the National Longitudinal Study (NLS), evaluating 23,000 members of the high-school class of 1972. More than 1,300 schools nationwide ultimately participated in the survey, which sought to determine how a person's secondary education influences the decisions he or she later makes, such as whether to go to college and what courses to take. The institute conducted and administered the initial survey in 1972 as well as four subsequent surveys of the sample group over the next seven years. In the first follow-up survey in October 1973, more than 21,300 students from the original sample group responded—a remarkable response rate of more than 92 percent.

The findings were illuminating. Seventy-four percent of former high school seniors had taken some form of postsecondary education after high school, including 23 percent who received college degrees. Few claimed to have experienced sex discrimination during high school, although many African-American and Hispanic students said race discrimination had affected their chances of receiving a good education. While 84 percent had stated in 1972 that a very important life goal was "being successful in my line of work," only 75 percent shared that opinion seven and a half years later. The findings helped guide federal, state, and local policies involving the transition of young people from school to adult life.

The NLS project deepened RTI's capabilities in longitudinal surveys, assisting the development of sophisticated telephone tracing operations to track highly mobile sample groups and fostering new techniques to improve survey response rates; these included the use of small cash incentives to encourage people to return mailed questionnaires. Most profoundly, the project inspired development of new computer programs for data entry and analysis.

In the early 1970s, RTI conducted the first National Longitudinal Survey, a frequently repeated study that has helped policymakers better understand the transitions made by teenagers, such as these students cheering their Iowa basketball team in 1972, from high school to adult life.

The Search for Industrial Partners

It was clear to George Herbert that revenues at RTI were lopsided, with the lion's share coming from government contracts. Wanting to expand the base of industrial and commercial clients to 25 percent of research volume, Herbert directed two researchers to put aside their usual work and undertake a detailed study of the subject.

In January 1972, after discussion and visits with numerous trade associations and more than 80 corporations, the study was completed. Its recommendations, which included patent development and the recruitment of experienced researchers from industry, came to little. "The long-term development of relationships with potential industrial clients just wasn't among RTI researchers' priorities," explained Charles X. Larrabee in *Many Missions,* his book covering the institute's first 31 years. "Their professional preferences all favored governmental or academic research over the problem-oriented, new-product [and] applied research needs of industry."

The subject was put on the back burner for the time being, since the institute certainly was growing. More than $9.9 million in contract revenue was recorded in 1972, up from $4.7 million in 1967. Much of it derived from RTI's broad range of quality-of-life research projects. Conversely, contract dollars from the hard sciences and engineering, such as the Dreyfus Laboratory's polymers research, were stagnant, particularly after Peterlin retired in 1973. This was despite RTI's having shifted its research focus toward applications-oriented projects—among them the development of biodegradable polymer capsules for the sustained release of hormonal substances like contraceptive drugs.

RTI's tenth building was named for longtime Board of Governors Chairman George Watts Hill, center, flanked here, left to right, by William H. Perkins Jr., Samuel C. Ashton, George R. Herbert, and William F. Little, near the structure's eventual site. The 46,000-square-foot building, dedicated in October 1977, initially housed social and statistical sciences staff and equipment. Today, it also houses corporate leadership and RTI's library.

The collection of air samples to measure the range and volume of airborne pollutants has been the subject of RTI research since the 1960s. James B. Tommerdahl, who would later become RTI's vice president of environmental sciences and engineering, alights from an EPA plane in 1974.

For the Betterment of Humanity

Although not yet codified as such, the institute's mission was beginning to take shape—R&D for the betterment of the human species. All of its work, from education and health to the environment, fit this profile.

Such was the case in 1973 when EPA contracted with RTI to collect and analyze suspect carcinogens and mutagens in the atmosphere. Institute chemists developed the first methods to simultaneously identify hundreds of volatile organic compounds (VOCs) in effluents and ambient air in minute traces measured at parts per trillion. This breakthrough allowed a quick reading of the makeup of the entire mixture of volatiles being sampled. Three years later, when researchers looked for traces of three toxic substances in the atmosphere surrounding an Arkansas chemical plant, they discovered seventeen other toxic substances. One was a soil fumigant, dibromochloropropane (DBCP), later determined to cause sterility in men. In subsequent medical testing, workers at the plant were found to have low to zero sperm counts.

The Special Supplemental Food Program for Women, Infants, and Children, better known as WIC, is a government-funded program to improve the nutritional status and birth outcomes of the pregnant poor. Eligible WIC participants often receive a check or voucher to buy food and other necessities at participating stores. The U.S. Department of Agriculture first contracted with RTI to evaluate the effectiveness of the WIC program in 1973. RTI confirmed the program's value.

Research in federal social programs, a mainstay since the War on Poverty, also assisted the betterment of humanity. In 1973, the USDA contracted with RTI to gauge the effectiveness of the Special Supplemental Food Program for Women, Infants and Children. Known as WIC, this federal assistance program, administered at the local level, offers food supplements, nutrition education, and health care counseling to eligible low-income pregnant women, breast-feeding mothers, infants, and preschool children. Before WIC could be implemented on a national scale, Congress mandated that local demonstration projects be undertaken first to pinpoint strengths and weaknesses. RTI was selected as the statistical coordinator for the demonstration projects, ultimately collecting, processing, and analyzing clinical data on 30,000 children and 15,000 women. This massive data coordinating and reporting task confirmed the efficacy of WIC, guiding national implementation in 1975. Its successful implementation also led to subsequent WIC research contracts for the institute.

Surprises in Substance Abuse

Research in substance abuse was another area where RTI's work was improving the human condition. It was also another area of repeat business. In 1973, RTI released a groundbreaking report entitled *Drug Usage and Arrest Charges*, funded by the U.S. Department of Justice. The report revealed no evidence that drug users were more often involved in violent crimes than non-drug users—a conclusion that surprised many. "Everyone figured that drug abuse and criminal behavior were associated," says Valley Rachal, Ph.D., an economist who worked on the project. "We blew that away. The project also introduced

us to substance abuse experts across the country, helping us develop a continuing program in this area, learning the key issues in the field as they emerged."

Two years later, Rachal led another eye-opening survey, this one of U.S. teenagers' drinking behavior, funded by the National Institute on Alcohol Abuse and Alcoholism. "We surveyed 13,000 kids from the seventh to twelfth grades, using a theoretically based questionnaire self-administered in a classroom situation, the typical model then," Rachal says. "We found that nearly one-quarter of high school juniors and seniors were heavy to moderately heavy drinkers, a statistic that startled the country and guided national policy changes. We further determined that adolescents who drank heavily tended to have other problem behaviors, such as doing less well in school." The survey also asked questions about drug use. It noted that 15 percent of high-school students had tried marijuana before the age of thirteen. By age eighteen, however, more than half had tried it. A subsequent survey by the institute in 1978 confirmed the earlier findings.

The institute also undertook related research into effective forms of treatment for drug and alcohol abuse. The National Institute on Drug Abuse contracted with RTI in 1975 to conduct and administer the Treatment Outcome Prospective Study (TOPS). Researchers interviewed 12,000 drug users at 40 clinics nationwide about the effectiveness of the treatment in curtailing drug usage. Subsequent follow-up surveys led the institute to conclude that a stay of a minimum of three months in a publicly funded drug abuse treatment program was required to successfully reduce drug use post-treatment. "The study confirmed that treatment was good public policy," says Rachal, who led one of the follow-up surveys.

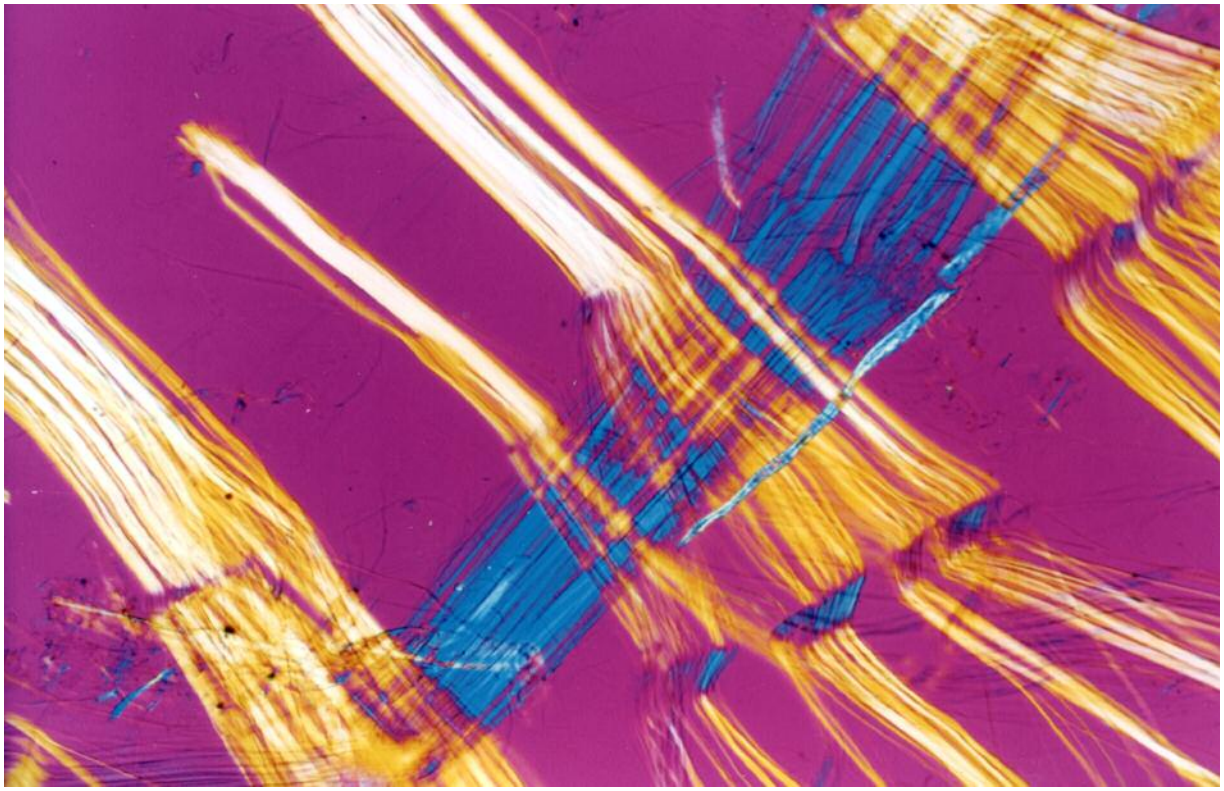
Altogether, RTI conducted 58 survey projects between 1974 and 1978, generating $39.3 million in contract research revenue, up from 41 projects and $13.6 million in the 1969–1973 time frame. Among these projects was another groundbreaking study, this one on crime and misbehavior in public schools. RTI and the National Institute of Education collected more than 14 million items of information on the subject, culminating in the publication of *Violent Schools—Safe Schools.* Among many other sobering findings, the report stated that 282,000 students and 5,200 teachers were assaulted each month. The public was appalled, as was the government. U.S. Secretary of Health, Education, and Welfare (HEW) Joseph A. Califano Jr. told Congress that U.S. schools had become "centers of danger and violence for teachers and students."

Taking Health Care's Temperature

The range of projects arriving at the institute's front door was extraordinary—from a study of drugs like propranol to prevent heart attacks, for the National Heart, Lung, and Blood Institute, to an evaluation of mathematics and science courses in grade schools, for the National Science Foundation. Many received national attention, such as a study for the Department of the Treasury on recommended changes to the U.S. coin system. RTI's conclusions: the penny should be eliminated (leading one wag to describe RTI as "penny-pinching") and a more convenient dollar coin (later issued as the Susan B. Anthony dollar) minted. RTI even researched the efficacy of a national system of refundable five-cent deposits for food and beverage bottles and cans.

A five-year project sponsored by the National Center for Health Services Research called for analyzing medical services across the country—what these services were, how much they cost, who used them, and how much users paid before insurance absorbed the remainder. Launched in 1976, the National Medical Care Expenditures Survey (NMCES) was dubbed "Nemesis" by the statistical sciences staff because of its size. It involved the collection of an unprecedented volume of medical care data. More than 13,500 families were interviewed six times over a 15-month period. Sixty percent of the 22,000 physicians who provided services also were surveyed, as were the thousands of hospitals and clinics providing care and the employers and insurance companies that paid for it. On any given day, 125 or more RTI staff members could be working on the $22 million project. The findings were passed on to HEW for policymaking decisions.

In 1980, the institute conducted a companion project to NMCES—the National Medical Care Utilization and Expenditures Survey. Although its complexity echoed that of NMCES, the statistical sciences staff had more legroom to conduct it, having moved into the new 46,000-square-foot George Watts Hill Building in 1977.



The range of subjects under study by RTI is a constant reminder of its multidisciplinary scientific breadth. From a study recommending the minting of a new dollar coin, later implemented as the Susan B. Anthony dollar, opposite, to analyses of the health effects of asbestos fibers, left, and the environmental hazards at Love Canal, below, RTI provides invaluable research to public policymakers.

EPA Becomes a Major Client

The end of the 1970s ushered in a remarkable series of quality-of-life projects in both environmental and international research. In February 1978, RTI's environmental researchers traveled to Niagara Falls, New York, where residents were complaining about strange odors in their homes. The researchers had discovered Love Canal, one of the worst environmental disasters in American history. "Love Canal was extremely important to the history of the institute, putting it on the map for much additional environmental research," says Bill Little.

EPA now became a major client. The institute also won a contract to operate the Asbestos Information Hotline for an EPA program addressing asbestos in public schools. Human exposure to airborne fibers of asbestos, ubiquitous in building materials like ceiling tiles and insulation, was linked to such diseases as lung cancer, asbestosis, and mesothelioma. RTI's development of the first nationally accepted methodology for testing the presence of asbestos in building materials guided numerous EPA projects to investigate the efficacy of asbestos sampling and analytical techniques at the hundreds of asbestos-testing labs that had sprung up across the country.

EPA subsequently contracted with RTI in 1978 to study the range of pollutants produced by different industries, such as benzene emissions from the production of agricultural chemicals. In another study, this one for the chemical company Monsanto, RTI researchers looked at the volume

RTI gathered data on air contaminants in conjunction with the EPA-funded Detroit Exposure and Aerosol Research Study. Forty Detroit residents donned RTI-developed sampling vests, opposite, worn here by RTI's Jennifer Greer, that collect data on particulate matter and gaseous pollutants; this data was then compared with data from stationary monitors. Above, RTI biologist Pat Cunningham analyzes data on contamination in bodies of water and in fish.

Environmental Studies and Innovations in Energy

RTI has been in the vanguard of research into threats to the environment for more than four decades—its work ranging from collecting, analyzing, measuring, and monitoring airborne pollutants to helping the government of Beijing, China, measure and reduce air pollution in advance of the 2008 Olympics.

The institute was present at the beginning of the environmental movement. In 1965, RTI began conducting atmospheric chemistry research. That year, a 120-foot air sampling tower at UNC, one of the nation's first facilities for studying vertical gases in a rural environment, was dismantled and relocated to RTI, and a 350-square-foot building for data-recording equipment and surface instrumentation was erected nearby. Projects included measuring the levels of gases and particulates in automobile exhaust, assessing the costs of controlling air pollution, and estimating costs of compliance with new environmental regulations.

Shocking Find at Love Canal

In 1973, the EPA contracted with RTI to collect and analyze suspected carcinogens in the atmosphere. Institute chemists developed the first methods to identify volatile organic compounds in effluents and ambient air, in minute traces measured at parts per trillion. Five years later, researchers traveled to Niagara Falls, New York, where they discovered the cause of strange odors in people's homes. Below a 36-block area of the city lay 21,000 tons of buried chemical waste, dumped in the canal and covered with five feet of clay by Hooker Chemical Company in the 1940s. A decade later, schools and houses were built on the land.

As time progressed, a rash of diseases—including epilepsy, asthma, urinary tract infections, nervous disorders, and cancers—came to the surface. Traces of toxic chemicals were even found in the milk of nursing mothers. Then in August 1978, after record rains, toxic substances began percolating from underground into the backyards and basements of area homes and a public school.

"We had developed these new techniques to capture potentially toxic chemicals in the air," says Edo Pellizzari, Ph.D., who led the research project that brought Love Canal to the world's attention. The new techniques were based on the use of small, wearable sampling monitors that collected organic substances like benzene and toluene in the surrounding air continuously for hours or days. The samples were later analyzed in the parts-per-billion range at the institute's laboratories, using gas chromatography and mass spectrometry. "We sampled in people's basements, and up popped these awful chemicals that were not in the standard compendium for a home," Pellizzari says.

President Jimmy Carter declared a state of emergency at Love Canal in May 1980, and 800 families were ultimately evacuated from their homes. Most of the homes in the area were demolished, and the area near the landfill remains largely abandoned today. The crisis did have an upside, however: it led, seven months after Carter's declaration, to the passage of the federal Superfund Act, which gives the U.S. government authority to mandate cleanup of heavily contaminated sites, protecting people and communities from the ill effects of toxic waste.

The Body's Reaction to Toxic Exposure

Environmental research proliferated at RTI in the 1980s. EPA and the National Cancer Institute funded the TEAM (Total Exposure and Assessment Methodology) project, in which institute researchers analyzed the relationship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between a person's exposure to toxic substances and body burden—the volume of a specific chemical retained in body fluids and tissue that can cause health problems. In this quest, RTI put its air sampling monitors to work and also developed a special spirometer to collect human breath samples.

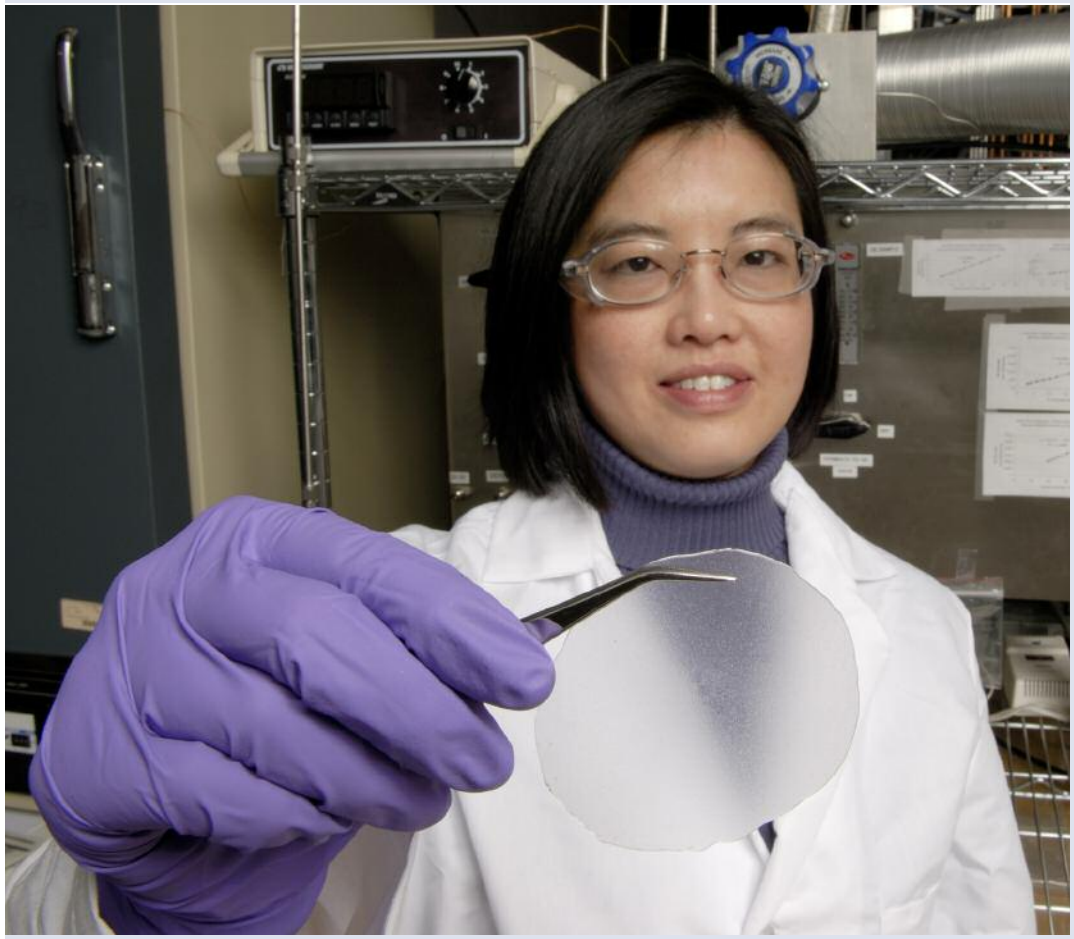
The goal was to develop a model that could predict the frequency of exposure to a particular organic compound in a population and the body burden that results. Researchers also wanted to find out how the route of exposure—via air, drinking water, or food—affected body burden. For example, the human body may not absorb a chemical when it is present in drinking water, but it may absorb that chemical when it is in the air. "Knowing the specific route would assist public policymaking to reduce health effects outcomes," says Pellizzari, then research vice president for analytical and chemical sciences.

Acid Rain Research

Acid rain was another burgeoning area of research for RTI in the 1980s. Pollutants spewed by power plants, factories, and automobiles formed acidic gases and particles in the atmosphere. These mixed and fell to the ground in rain, snow, or sleet, or otherwise reached it in dry form, becoming acidic upon contact with water. Scientists linked the acidic pollutants to dying lakes and forests and to the depletion of insect and aquatic life. More research was needed before costly regulations on industry could be proposed seriously.

EPA consequently retained RTI in a five-year study of the effects of both wet and dry acidic deposition on different materials. At a monitoring site on RTI's campus, scientists examined samples of stone, metals, and painted surfaces exposed to rainfall and dry acidic deposition for physical and chemical changes. The findings directed policy changes, including regulations requiring flue gas desulfurization processes at coal-burning power plants to reduce sulfur emissions.

Also in the 1980s and 1990s, RTI provided quality assurance oversight of the three major precipitation networks in the United States. RTI researchers visited approximately 230 sites every two years.



CFCs and the Ozone Layer

RTI's environmental research broadened in the early 1990s to address rising concerns over the depletion of the ozone layer of Earth's atmosphere. Chlorofluorocarbons (CFCs)—a family of nontoxic, inert, and quick-drying chemicals present in refrigerants, cleaning solutions, and industrial solvents—were identified as a major cause of stratospheric ozone depletion, provoking the federal government to mandate a phase-out of CFC production by 2000. The onus was on the private sector to find alternatives to the use of CFCs.

In response, RTI formed the Surface Cleaning Technology Consortium, a group of global companies in the semiconductor, aerospace, and electronics industries that used CFCs in their solvents to clean components and equipment. "Our role was to work with the companies in developing and demonstrating new cleaning processes that did not contain CFCs," says Elizabeth Hill, an environmental scientist who joined the institute in 1990. "By sharing the results of each other's research, the consortium could do far more than a single organization on its own." Among the group's contributions were a carbon dioxide "snow" to remove particles, new

solvents to clean the equipment used to make computer disk drives, and an alternative process to make Teflon-coated surgical instruments.

Having established the National Exposure Registry, a national database of people who had been exposed to toxic substances, RTI won a large EPA grant in 1994 to conduct the National Human Exposure Assessment Survey, a long-term study of the ways that humans are exposed to potentially toxic chemicals in the environment. Other projects in the 1990s involved developing emission standards for various industries to help guide new regulations on air pollution and research into the transdermal routes by which toxins enter the body.

In more recent years, EPA has funded RTI as the sole contractor for the chemical speciation of $PM_{2.5}$ samples. $PM_{2.5}$ refers to airborne particulate matter with a diameter of 2.5 micrometers or less. Because of their miniscule size, these particles can penetrate to the deepest parts of the lungs when inhaled—and scientific studies have linked such fine particles with serious health problems, especially in young children and the elderly. Results of another EPA project conducted by RTI encouraged the building industry to discontinue use of chromated copper arsenate used to preserve wood for building materials. EPA also contracted with RTI to study and potentially revise the Pollution Abatement Costs and Expenditures Survey, the only comprehensive source of the costs of environmental regulations.

Clean and Alternative Energy

RTI today is working on solutions to air pollution by developing alternative energy sources and clean coal technology. A significant focus of RTI's research has been on controlling sulfur, a major contributor to acid rain and global warming, in new integrated gasification combined-cycle power plants. These powerful producers of electricity must become more environmentally friendly and less expensive if they are to be commercially viable. RTI has tackled the problem on several fronts, from developing agents to remove sulfur from motor fuels and gasoline to pioneering advanced, low-cost alternative fuel sources, such as biomass and clean coal. Not only are biomass and coal plentiful, they are also versatile—used to generate electricity and convertible into chemicals, plastics, motor fuels, and substitute natural gas.

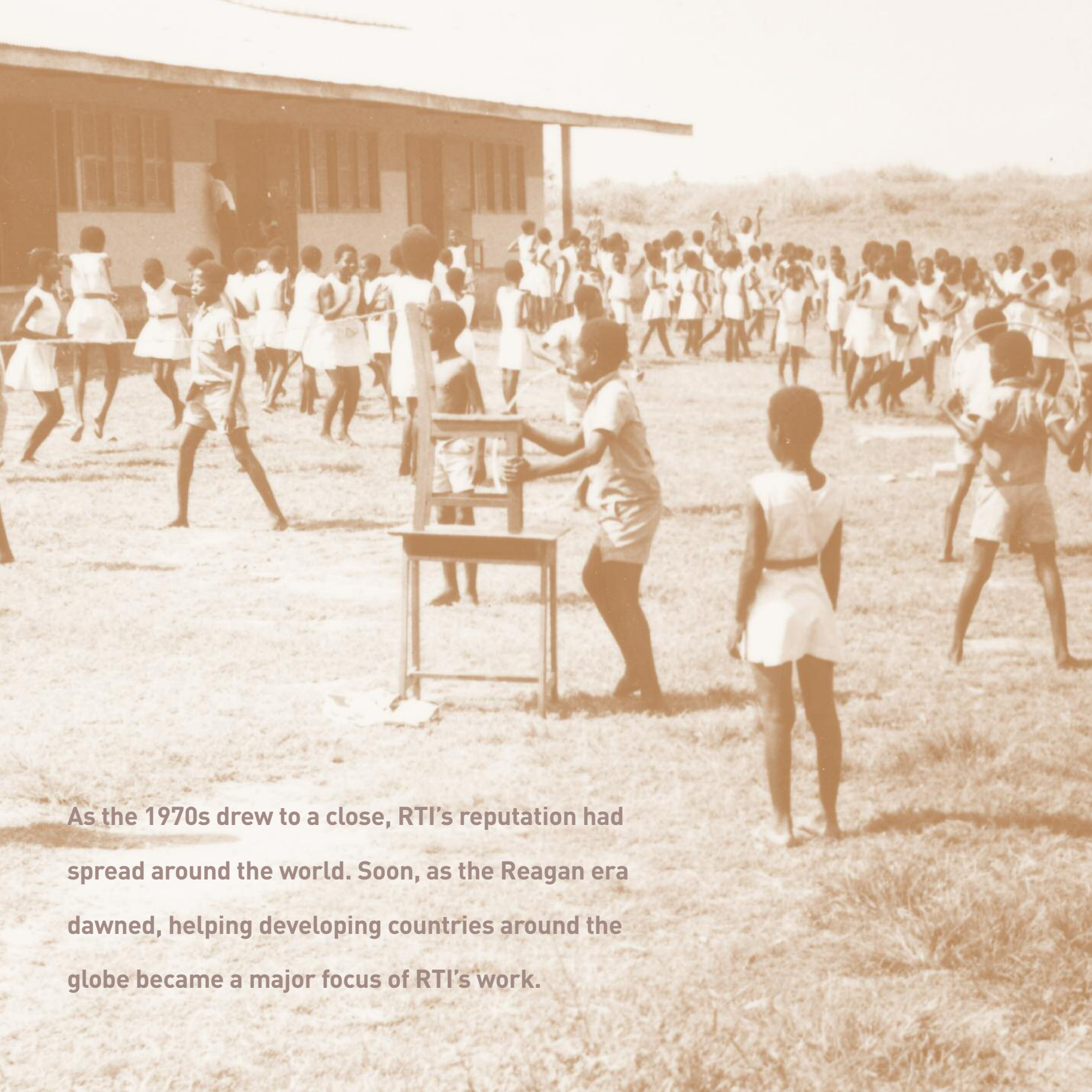
RTI's work touches nearly every step in the process of converting coal into synthetic gas to generate power, fuels, or chemicals. For example, RTI has helped the Department of Energy and companies including Eastman Chemical and Bechtel discover new ways to convert coal into industrial chemicals to make plastics, polyesters, latexes, and synthetic lubricants. Historically such products are derived from petroleum. Switching to coal would help reduce the nation's dependence on foreign oil.

The institute's achievements include multiple patents for clean coal technology and an R&D 100 Award, which recognizes technology to remove sulfur from synthetic gas more effectively and at a lower installation cost than existing technologies. "If we can find more cost-effective ways of making coal cleaner, it will improve the opportunities for its use as an important fuel," says Dave Myers, Ph.D., RTI's vice president of engineering and technology.

Beyond coal, RTI is in the forefront of research into other energy sources. The institute and the University of Texas recently announced the development of an efficient new process for purifying hydrogen, which is free of pollutants and can be produced from abundant domestic energy resources, including coal and nuclear power. Funded by the Department of Energy and the National Science Foundation, the research team developed a family of molecularly engineered copolymer membranes that selectively remove larger gases such as carbon dioxide from smaller gases like hydrogen.

RTI has substantially expanded its capabilities in environmental services and regulatory development since the early 2000s, using its expertise to improve air quality and reduce human exposure to hazardous air pollutants around the world. As RTI moves into its second 50 years, it is applying much of its industrial sector knowledge to the study of greenhouse gas emissions and their contribution to climate change.

RTI scientists including Laura Toy, opposite, developed a polymer membrane that brings an energy-efficient, low-cost hydrogen purification process a step closer to reality—part of the institute's work in sustainable energy. Above is RTI's energy laboratory, where such breakthroughs as sorbents to remove carbon dioxide and sulfur from coal and gas fuels were made.



As the 1970s drew to a close, RTI's reputation had spread around the world. Soon, as the Reagan era dawned, helping developing countries around the globe became a major focus of RTI's work.

of the pesticide aldicarb in wells on Long Island, New York. Yet another RTI study measured the level of strontium 90—a radioactive isotope present in the fallout from nuclear explosions—in milk.

Reagan-Era Changes at RTI

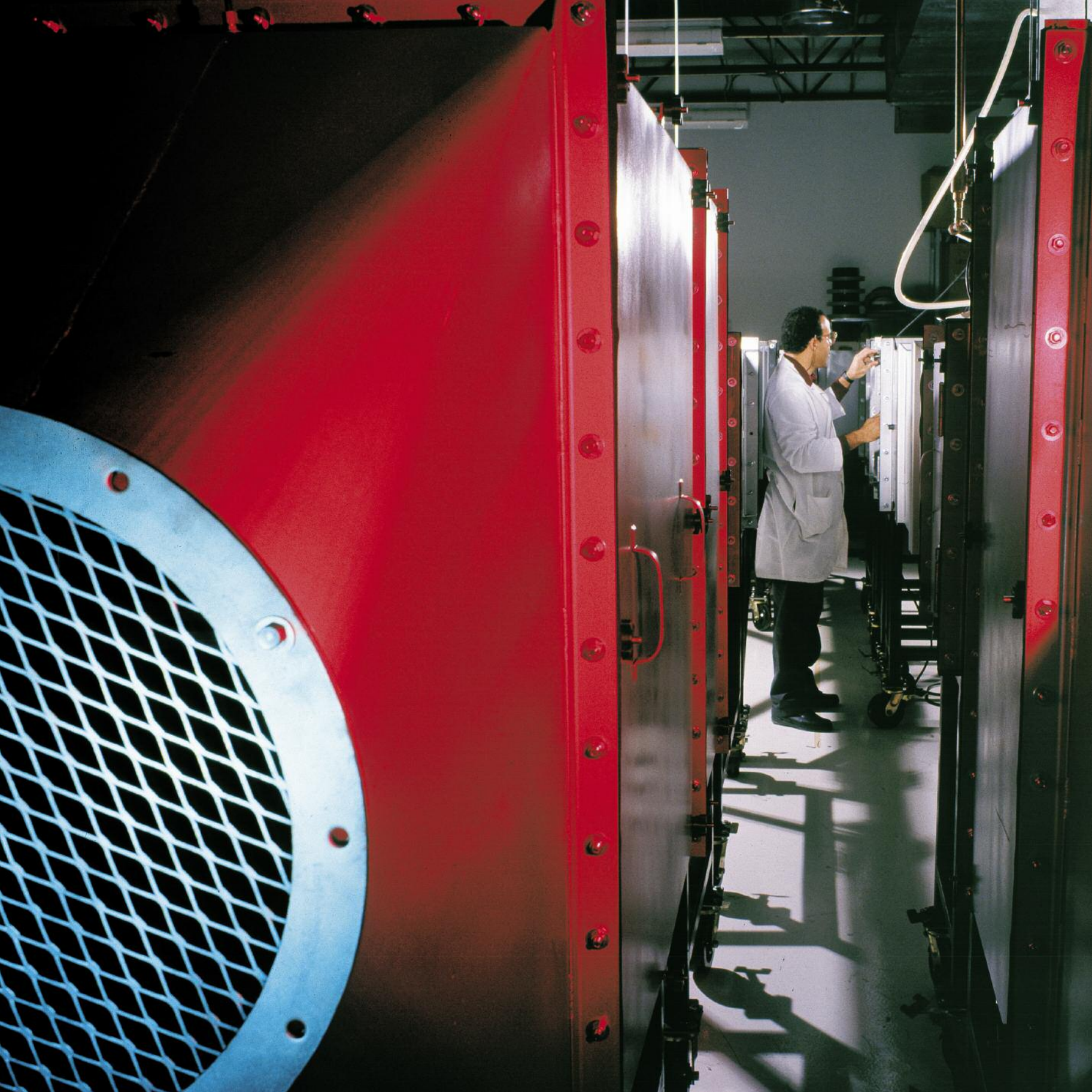
As the 1970s drew to a close, RTI's reputation had spread around the world. In 1977 the institute formed the Office for International Programs (OIP) to coordinate international work across all of RTI and to further its global agenda. The pace of projects accelerated; almost all were funded by USAID to improve the quality of life in developing nations. Then, as Jim McCullough, Ph.D., an urban planning and public finance specialist who headed OIP for ten years, notes, "Mr. Reagan came into office."

The administration of President Ronald Reagan was predicated, in part, on reducing the size of government. Many federally sponsored projects, especially in the social sciences, the very core of the institute's existence, were curtailed as RTI's major clients tightened their belts. As a result, and because of societal changes in some developing countries, social scientists at RTI began to look closely at opportunities in international development—an area that previously had not been a major RTI focus.

Many developing countries were decentralizing, moving more government services from the capitals to other cities. "Local government planning and management was a pretty wide-open field at the time," McCullough says. "We offered our specialized expertise in how water systems could be financed, tax systems set up, and local governments budgeted and trained." This, too, became another core competency guiding much additional work.

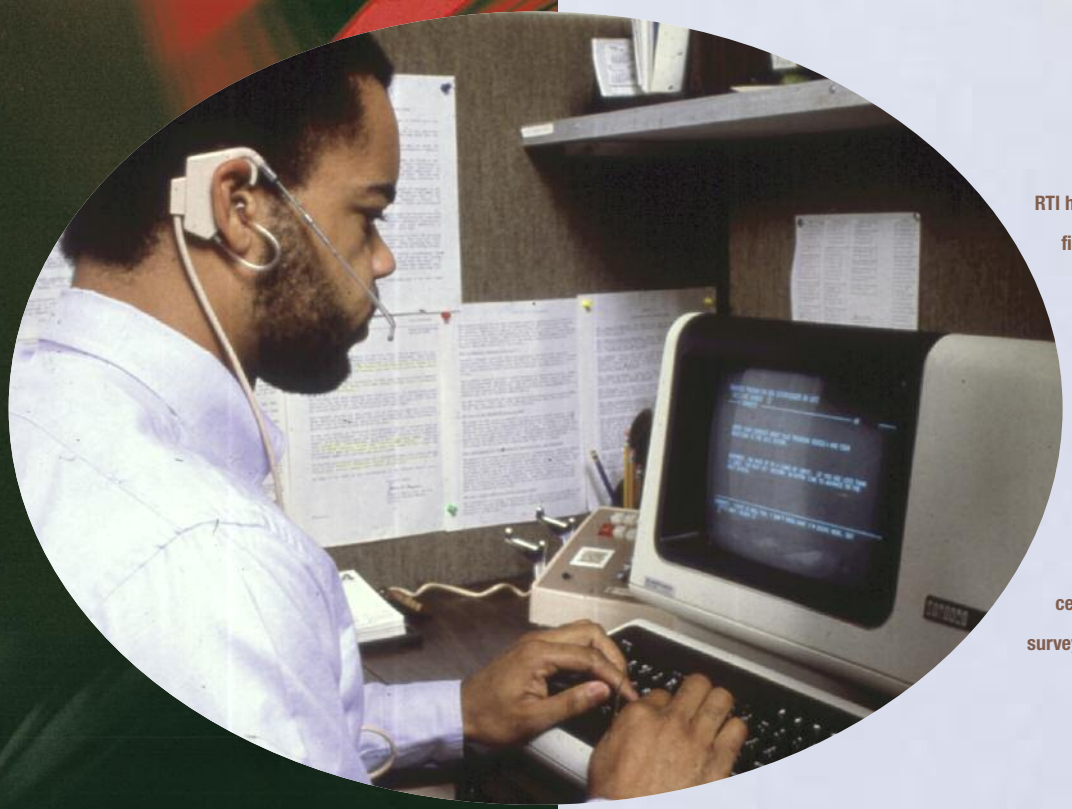
OIP also leveraged the institute's capabilities in alternative energy research on behalf of the third world. "In Morocco, for example, we developed an R&D center on solar, wind, and hydroelectric power," McCullough says, referring to a 1982 project on renewable energy for USAID.

In some of the most remote parts of the world, RTI's work to improve the human condition is having a profound impact—increasing literacy, improving government and basic infrastructures, devising alternative energies, and enhancing nutrition, among other far-reaching initiatives. Opposite, schoolchildren in Ghana play outside their school in 1974. In Morocco, left, RTI studied solar, wind, and hydroelectric power.

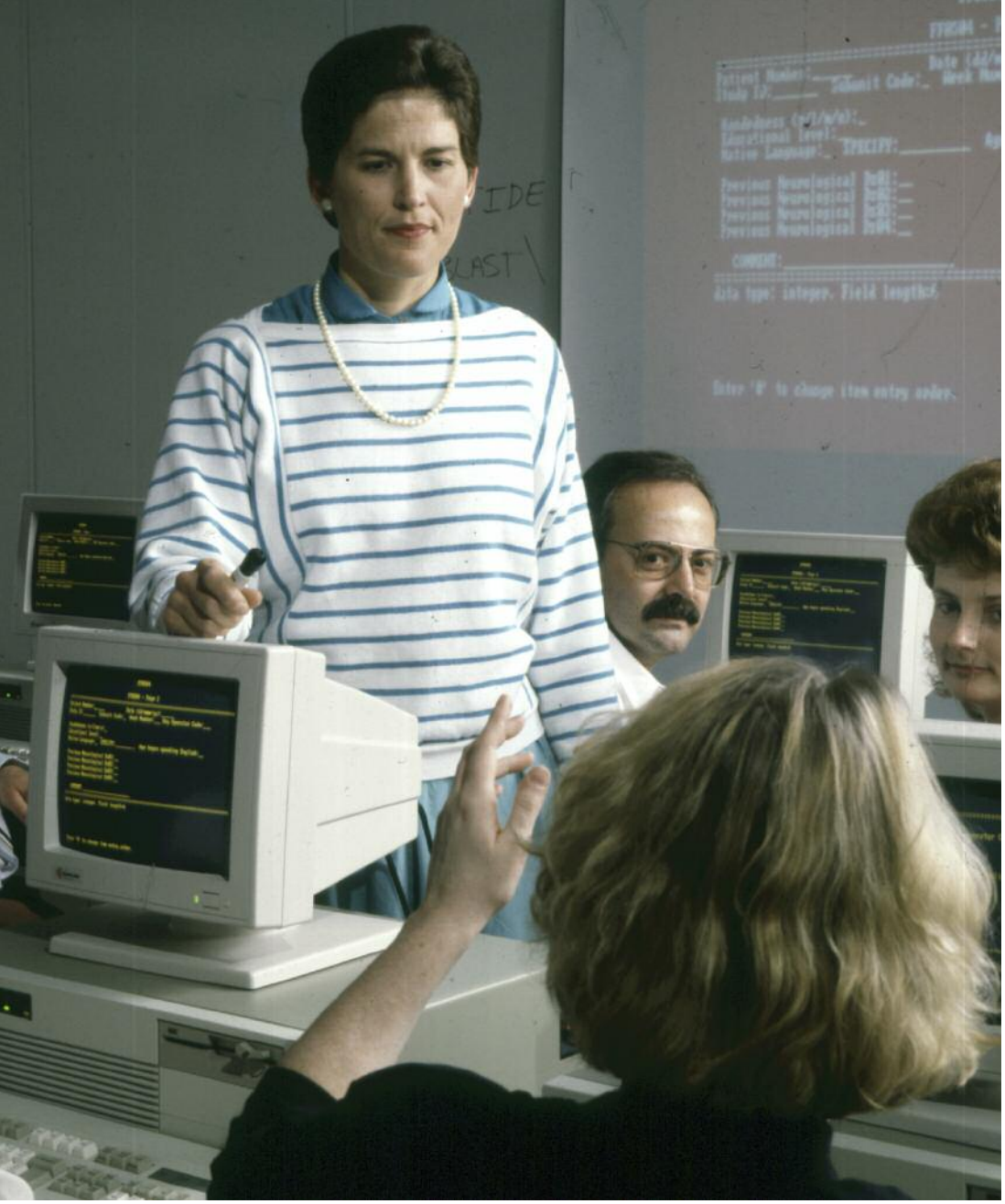


CHAPTER FOUR

Research in the Reagan Era



RTI has applied its multidisciplinary skills in aerosol filtration, gas adsorption, and microbiology to help the Environmental Protection Agency and the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) evaluate the efficiency of air-cleaning equipment in removing particulate, gas, and bioaerosol contaminants. RTI's filter test facility, opposite, helped develop testing methods that served as the basis of a new ASHRAE filtration efficiency standard. Inset, RTI's call centers have been the backbone of the institute's survey work for five decades.



The federal government remained RTI's largest source of contracts during the 1980s, with nearly every project leveraging the institute's interdisciplinary strength to shed light on a particular societal challenge and guide policies for a better future.

One month before Ronald Reagan assumed office as the 40th president of the United States in January 1981, legislation presenting profound opportunities for RTI was signed into law. Known as the Bayh-Dole Act, it gave nonprofit research institutes and universities intellectual property control of inventions derived from federally funded research. A new revenue source materialized for RTI. "We'd never thought of commercializing the fruits of our research—our purpose was getting it out and letting people benefit from it," says Alvin M. Cruze, Ph.D., an economist who joined the institute in 1965. "It took a while for us to realize we could now license the results of our government-sponsored research—not that this drove us in a different direction. We were still focused solely on improving the human condition."

At the beginning of the 1980s, more than three-quarters of the institute's research involved quality-of-life studies. This broad swath of projects included research in medical care costs, health systems, and health resources; education evaluation and assessment of education outcomes; crime, delinquency, and justice; alcohol and drug abuse; biochemistry and the synthesis of new drugs; anti-fertility compounds and drug delivery systems; environmental monitoring and measurement; pollution control strategies and economic impacts; air navigation; biomedical engineering; and semiconductors.

The Difficult Years

Significant changes in government priorities in the early years of the Reagan administration affected RTI, especially its research in the social sciences—and 1981 and 1982 were difficult for the organization. Research revenues dipped to

$40 million after cresting at a record $47 million in 1980, prompting reductions in staff, from 1,100 employees in 1980 to fewer than 850 in 1981. Fortunately, new opportunities emerged as the country's attention shifted to national defense and health care.

George Herbert restructured the institute in 1983 to focus resources toward specific projects and programs. Dan Horvitz was appointed executive vice president, a new position with operating responsibility for all research activities. Ten research vice presidents reported to Horvitz, each responsible for a unit's program and staff. "A new generation of leadership was given a chance to perform," says Cruze, who was named vice president of economics and social systems and later succeeded Horvitz as executive vice president.

In the early 1980s, RTI occupied 360,000 square feet of office and laboratory space in fifteen buildings on its 180-acre campus, in addition to offices in Charlotte, North Carolina, and Hampton, Virginia. (An office in Washington, D.C., was briefly shuttered in 1980 because of government cutbacks; it reopened in 1983.) Research Triangle Park itself boasted 32 corporate and government occupants, up from 16 in 1970. The musings of Archie Davis, who had predicted the emergence of a bustling park surrounding RTI, were coming true. From 1959 through 1981, the institute had earned nearly $300 million in cumulative research revenue from approximately 2,200 projects either completed or still in progress. Its cumulative net revenues of $9.9 million were reinvested in new facilities and equipment.

New Focus on Technology

The parent universities continued their close collaboration with RTI. The four institutions combined their resources with other state universities in 1981 to create the Microelectronics Center of North Carolina (MCNC). MCNC was funded by the North Carolina General Assembly to catalyze technology-based development in the state. The nonprofit organization, chaired by Herbert, sought to build partnerships among academic, research, government, and business communities that would advance innovation and economic development by delivering information technology services.

MCNC set up offices in a corner of RTI's Ragland Building and established its initial data processing and Internet capabilities in the computer room there. A "cleanroom"—a dust-free environment in which computer hard drives were assembled, inspected, and serviced—was built at NC State. Institute engineers and physicists fabricating semiconductor devices also used the facility

Alvin Cruze, left, and Daniel Horvitz, above, in photographs from the late 1970s, were among those at RTI who steered the institute through challenging times as the government shifted priorities in the early 1980s. Both Cruze, an economist, and Horvitz, a statistician, had long and distinguished RTI careers that began in the 1960s—39 years for Cruze and 31 for Horvitz. Opposite, RTI's Suzanne Matthews, chief instructor and training manager for the institute's AIDS project, leads a training class.

Microelectronics: A Tiny World with Huge Impact

Microelectronics—devices fabricated in submicron dimensions, forming the basis of all electronic products—has been an area of primary research at RTI since its earliest days. Research began in 1962 at the institute's Solid State Laboratory, which was at the forefront of the revolutionary development of integrated circuitry—complex circuits etched onto tiny chips of semiconductor material such as silicon.

In the 1970s, the institute's Center for the Synthesis and Study of Semiconductor Compounds endeavored to develop smaller, lighter-weight materials surpassing silicon in speed, frequency, and power. In collaboration with NC State University, RTI designed and built the world's first monolithic cascade solar cell, which doubled the efficiency of conventional silicon solar cells. Sunlight cascaded through its cell layers, thereby converting more of the solar spectrum into electricity than in ordinary solar cells.

In 1983, the institute broke ground on a new 47,000-square-foot building, named for RTI's first president, George Herbert, to house its semiconductor materials research and device fabrication. The institute's custom integrated circuit foundry fabricated on the order of 1,000 semiconductor wafers each year. Institute researchers were considered among the best in the world at growing single-crystal diamonds and other semiconductor materials faster, thinner, and in greater volume for military, avionic, and space applications. 3M Company was among its clients, funding a project to make synthetic diamond coatings for the optics, electronics, and machine tools industries. Clients for fabricated nickel-chromium resistors, metal capacitors, light-emitting diodes, and lasers included Sumitomo and Sandia National Laboratories.

A decade later, the institute patented its innovative ZIROC room-temperature, adhesive-free bonding technology, which made it possible to fuse and electrically interconnect silicon wafers to make chips that were faster, smaller, lighter-weight, and more powerful than existing circuits.

RTI's experience with microelectronics and semiconductor materials paid off in 2000 when part of its integrated circuit chip production facility was spun off into a private company called Ziptronix, Inc., which builds 3-D integrated circuits using the ZIROC technology. Ziptronix secured $6.5 million in venture capital in 2001 and soon was fabricating chips for Motorola, Northrup Grumman, and other companies.

In 2005, RTI acquired three divisions of MCNC Research and Development Institute, forming a microelectronics center that is a leader in 3-D integration, biomedical and environmental sciences, sensors and actuators, and signal electronics. Above and right, one of RTI's cleanroom facilities.

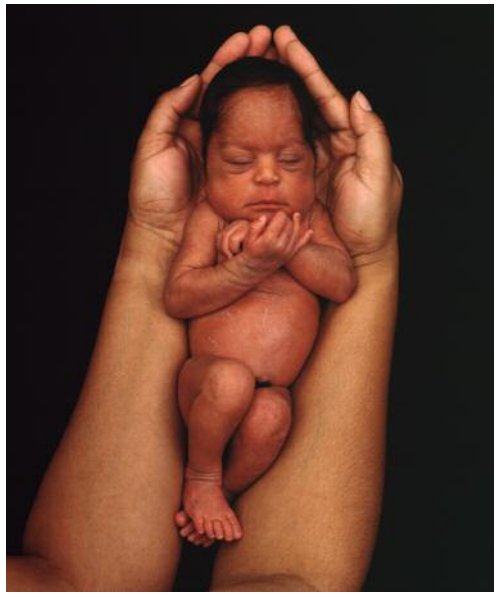

LAB

until 1985. Meanwhile, in 1983, RTI broke ground on a 47,000-square-foot facility—the Herbert Building—to house its semiconductor research. It was completed in 1984, and a cleanroom was added two years later. The cleanroom also was used by the institute's new Center for Aerosol Technology, which conducted indoor air research and aerosol exposure research and supported the institute's work for pharmaceutical companies in solving biological contamination problems.

Individual universities also brought RTI into some of their research projects. Duke University's medical school, for instance, retained RTI in 1981 as a subcontractor in a three-year study of the epidemiology of mental health, funded by the National Institute of Mental Health. RTI's survey specialists interviewed and tracked 3,000 residents with mental illnesses and 500 institutionalized people, all of them in North Carolina, to find out more about the occurrence, causes, and treatments of mental illness.

Although the first years of the decade were trying, RTI was able to obtain new sources of revenue. The federal government retained RTI in 1983 for a three-year contract to figure out how to grow single-crystal diamond film for use in high-speed devices powering an electronic warning and defense network in space—President Reagan's Strategic Defense Initiative. Institute scientists such as Bob Markunas were among the best in the world at growing single-crystal diamonds, which could survive both the extreme temperatures and intense radiation of space.

Environmental research also got a boost from President Reagan's Executive Order 12291, which required that cost-benefit analyses be done before regulations on toxic substances were



implemented. The institute's multidisciplinary resources were invaluable in this regard, as they were in providing scientific research and technical support services to the government's National Toxicology Program. NTP was created by the Department of Health and Human Services in 1978 to study the adverse effects of chemicals, radiation, and other environmental agents on the human body.

Prior to 1960, there was minimal testing of new drugs or food additives for toxic side effects that might cause cancer, birth defects, or mutations. Then, in 1961, evidence was first published that the sedative thalidomide, taken by women to relieve discomfort during pregnancy, sometimes caused birth defects in children. Public outrage resulted in federal mandates for increased toxicology testing. RTI provided developmental toxicology assistance to NTP during the year the program was created, then won a five-year, $13 million chemistry support contract from NTP in 1984. Follow-up contracts continue to this day.

Validating the Supplemental Food Program

Having successfully undertaken the demonstration project for the Special Supplemental Food Program for Women, Infants, and Children, RTI was retained by USDA in 1982 to conduct the first national survey of its impact. Economist Sally Johnson managed and coordinated the team of survey specialists and statistical and social scientists. Four separate but interrelated studies were simultaneously undertaken over the next three years. The data culminated in the publication of a five-volume report addressing broad subject matter, from infants' birth weight and prenatal care to mothers' smoking habits and alcohol consumption. "We interviewed 6,500 pregnant women at their homes," recalls Tom Virag, who worked on the project. "In addition, we measured the height, weight, head circumference, and dietary intake of children under five and tested their vocabulary skills. We compiled the data and then analyzed it."

USDA presented the findings to Congress, affirming that the program clearly improved the health of mothers, reduced infant mortality, and helped give newborns and young children a healthy start in life. Thus the government continued to fund WIC.

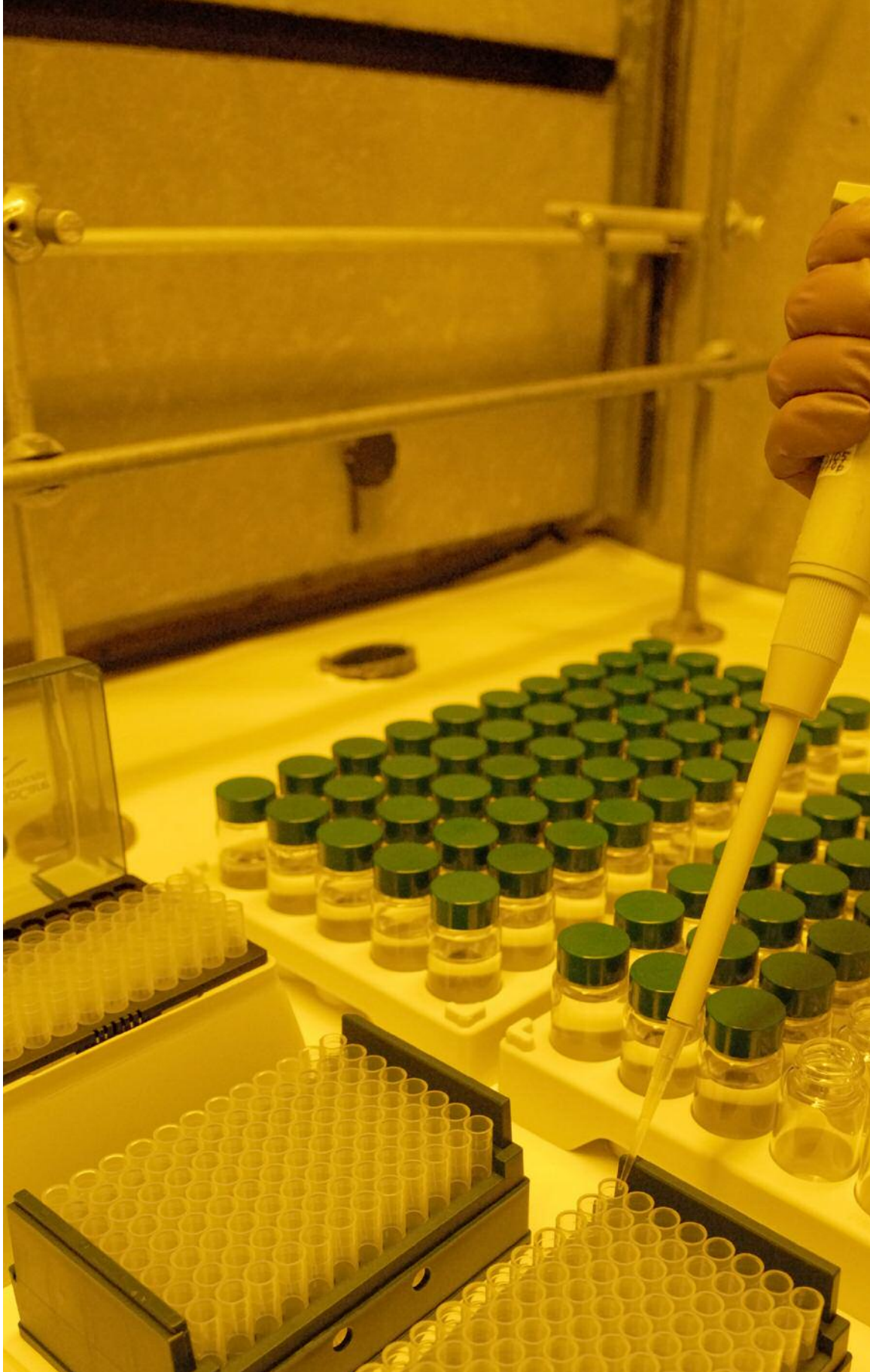
Substance Abuse at Home and in the Military

Many of the same scientists involved with WIC also participated in another complex study—the Worldwide Survey of Alcohol and Nonmedical Drug Use Among Military Personnel—funded by the Department of Defense (DOD). The project was prompted by a May 1981 fatal plane crash aboard the aircraft carrier USS *Nimitz*. Autopsies of six military personnel aboard the plane revealed traces of marijuana in their blood. DOD retained

RTI in 1982 to assess the effectiveness of the military's antidrug programs and contracted with the institute to undertake a follow-up survey in 1985.

In the first survey, nearly 22,000 people from all four branches of service were interviewed at 21 stateside and 37 overseas military installations; more than 17,000 service members were queried in the second. The first survey indicated that drug use in the military had declined from 27 percent in 1980 to 19 percent in 1982. The second survey noted a more substantive reduction in drug use, to 9 percent. Both studies concluded that alcohol abuse was a more serious problem, with 20 percent of respondents reporting "heavy drinking." The findings supported the continuation of military programs to prevent and treat drug abuse. In subsequent surveys by RTI, drug use and alcohol consumption rates in the military continued to fall, to 3 percent and 15 percent, respectively, by 1998. RTI researcher Robert Bray, Ph.D., was deeply involved in both of these studies and was lead editor of a 1999 book, *Drug Use in Metropolitan America*, that detailed policy, research, and program implications of drug use in and around major U.S. cities. The book was based on RTI research into nonmilitary drug use.

RTI is providing chemistry services to the National Toxicology Program, analyzing the toxicity of chemicals contained in a variety of commonly used consumer and industrial products at its toxicology lab, right. In conjunction with UNC Healthcare, RTI is examining the causes of low birth weight in babies, opposite.



The federal government remained RTI's largest source of contracts during the 1980s, with nearly every project leveraging the institute's interdisciplinary strength to shed light on a particular societal challenge and guide policies for a better future. This was evident in the institute's work on indoor air pollution and other menaces affecting human health, such as acid rain and so-called sick building syndrome, and, in the case of Vietnam War veterans, post-traumatic stress disorder (PTSD).

Sick Building Syndrome

Edo Pellizzari, Ph.D., and his colleagues had been studying the causes and health effects of indoor air pollution since their days at Love Canal in the late 1970s. By 1984, "sick building syndrome" was recognized as a potentially serious health issue. The energy crisis of the 1970s had prompted the development of more tightly sealed and heavily insulated structures to conserve energy. These new homes and office buildings, however, limited the exchange of fresh outdoor air with indoor air, permitting potentially dangerous levels of chemicals to accumulate. "The air inside can carry a heavier load of chemicals than you'd find outdoors in industrial areas of New Jersey," Pellizzari, research vice president for Analytical and Chemical Sciences, noted at the time.

The culprits included new carpeting, freshly waxed floors, recently painted walls, gas-fired ovens, and even a thin film of cleaning solution left on a kitchen counter. The institute undertook a one-year project for EPA that began with a review of the literature to discern gaps in knowledge. A multidisciplinary group of chemists, sampling and survey specialists, and statisticians then designed a study to fill in the missing pieces. Seven categories of air contaminants would be monitored at four locations—a new office building, a school, and two homes for the elderly. The contaminants included volatile organic compounds, formaldehyde, pesticides, nitrogen dioxide, respirable particulates, trace metals, and carbon monoxide. Chemists collected samples from carpets, drapes, furniture, and waxes for evaluation at Yale University. Researchers then measured the rate at which samples emitted the chemicals under different humidity and temperature conditions.

The data revealed very high concentrations of methyl chloroform, a volatile organic compound, following the immediate completion of a building. Over time, these concentrations declined. The finding argued for increased ventilation in the first six months of a new building's occupancy. Additional contracts on indoor air pollution followed. The vexing problem of toxic chemicals in indoor air later reared its head again after the discovery of high levels of formaldehyde inside mobile homes made available to victims of Hurricane Katrina.

Post-Traumatic Stress Disorder

In response to a congressional mandate in the 1980s, RTI conducted the most far-reaching and ambitious national mental health epidemiologic study ever attempted on any population at the time. The focus was PTSD, a psychological illness that can result from exposure to extreme psychological stress, such as that caused by combat. With Richard Kulka, Ph.D., the lead principal investigator, institute staff managed every phase of the four-year National Vietnam Veterans Readjustment Study. One hundred forty survey specialists and statisticians and 30 mental health

The release of volatile organic compounds into the air from the use of household paints, above; furniture stains, opposite; and other sources has been under study at RTI since the 1970s. Determining the toxicity levels of the particles released and their possible contribution to air pollution and human health problems are key research areas.

Understanding Substance Abuse

Federal, state, and municipal agencies spend considerable taxpayer money every year in programs to stem substance abuse, and governments want to know the effectiveness of these programs. RTI helps governments understand substance abuse, leveraging statistical and survey expertise to estimate the extent of abuse and substance trends across the nation, providing valuable data to policymakers in their design and adjustment of treatment programs.

Since 1988, RTI has conducted a nationwide survey of illicit drug, tobacco, alcohol, and nonmedical prescription drug use in the United States—the National Survey on Drug Use and Health (NSDUH). The study, sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA), an agency of the U.S. Public Health Service, is the primary source of data on substance use and abuse for government agencies, private organizations, researchers, and public policymakers, and the results are always illuminating.

In 2002, for example, RTI surveyed approximately 70,000 randomly selected individuals about their tobacco and alcohol use. The findings indicated that half of the U.S. population over the age of 12—an estimated 120 million Americans—drank alcohol, with 19 million people considered in dire need of treatment for a drinking problem. The same survey indicated that 22 million Americans suffered from substance dependence or abuse, while eight million needed treatment for a problem with illicit drugs. RTI determined that, sadly, only a relative few of those needing treatment received it.

In its work on the 2005 survey, RTI further helped SAMHSA develop a series of reports combining three years of previous survey data (1999-2001) to produce regional estimates of drug use and trends within each state. The goal of the project was to help the federal government allocate funds to states for their treatment and prevention programs. RTI's report unearthed differences in the patterns of substance use and related mental health issues among states and regions. For example, in Utah, 21.5 percent of people between the ages of 12 and 20 reported that they had consumed alcohol in the previous month, whereas in Vermont the number was 38.3 percent. Utah had the highest level of people age 18 or older reporting serious psychological distress in the past year (14.4 percent), while Hawaii had the lowest level (8.8 percent).

"This report shows that, although states may be uniquely affected by serious public health problems like underage drinking, every state and region must confront these issues," SAMHSA Administrator Terry Cline, Ph.D., commented following publication of the survey findings. "By highlighting the nature and scope of the challenges affecting each state, we can help focus and target substance abuse and mental illness prevention and treatment resources."

Results from the 2005 survey showed that while drug, alcohol, and tobacco use among youths age 12 to 17 was declining, people age 50 to 59—the Baby Boom generation—increased their illicit drug use, from 2.7 percent in 2002 to 4.4 percent in 2005. The most recent survey findings, in 2006, reaffirmed that illicit drug use among the young was declining, but there was a growing misuse of prescription drugs among young adults.

As with previous surveys, the data received significant media attention. More important, the knowledge generated empowered federal, state, and local agencies in the design of drug use prevention and monitoring programs, serving as the foundation of policy and resource decisions affecting millions of Americans.

SAMHSA has contracted with RTI to conduct the NSDUH survey through 2009. It remains the largest federally sponsored project in RTI's history.

professionals participated, conducting more than 3,000 interviews with Vietnam veterans across the country. "We wanted an objective quantification of the extent and severity of veterans' readjustment problems following their traumatic experiences in the war," says James Chromy, the overall project director.

The task was enormous. Aside from the initial interviews, staffers searched through more than 2,800 medical records, reviewed over 50,000 X-rays, developed and validated a diagnostic interview template for PTSD, and conducted follow-up interviews with nearly half the original sample. After the data was compiled, it had to be evaluated, verified, and summarized for testimony before Congress.

The study's broad conclusion was that most veterans had adjusted reasonably well to civilian life, although 15 percent suffered from PTSD. "This was groundbreaking work that led to the publication of a book, *Trauma and the Vietnam War Generation,* authored by several researchers on the team, not to mention enormous public policy attention," Chromy adds. "Our connection to the universities brought a lot of their people to the project, some as principal investigators." The institute's research ultimately contributed to the development of improved mental health services for veterans suffering from PTSD—an issue of critical importance today in the aftermath of the 9/11 attacks and the wars in Afghanistan and Iraq.

Aging and HIV/AIDS

As the 1980s drew to a close, RTI was involved in a remarkable series of projects. NASA commissioned a project led by Doris Rouse, Ph.D., to examine how memory loss in older individuals contributed to their wandering, which put them at risk of danger. The research guided the development of devices using NASA telemetry technology that alerted caregivers when a memory-impaired person strayed beyond safe bounds. Another project, funded by the National Institute on Aging, called for developing interviewer manuals and providing interviewer training and data collection for a national survey on nursing home care and quality.

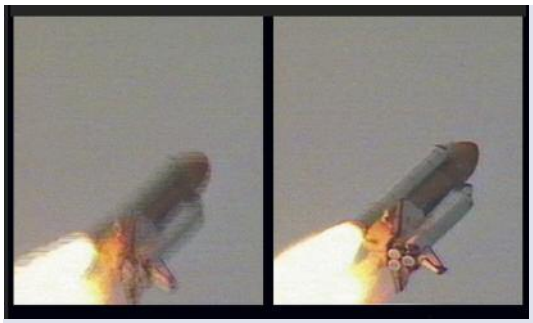
RTI brought its research abilities to bear on understanding HIV/AIDS and developing approaches to prevent its spread. More than 23,000 people in the United States had succumbed to the disease by 1987, and another 40,000 were diagnosed with HIV that year. New projects involved researching heroin usage rates, developing a transmission model for HIV, and researching the pulmonary complications of AIDS.

George Herbert Passes the Torch

In June 1989, after more than 30 years of leading RTI, George Herbert announced his intention to pass the presidency on to a successor. The following month, RTI's board of governors elected F. Thomas Wooten, Ph.D., to become president at the end of the fiscal year.

In his last years at the helm, Herbert had much to be proud of. Several new buildings had been erected, and a new institute office had just opened in Cocoa Beach, Florida, to address the safety of scientific, commercial, and military space launches. Moreover, revenues had reached a record $84.6 million in 1988 and would hit the $88 million mark in 1989. A decade that had begun with layoffs ended with a staff of nearly 1,500 people—400 more than in 1980—an astonishing metric for Herbert, RTI's first employee, who had once shared "headquarters"

In the early 1980s, RTI surveyed the use of illegal drugs and other substances by military personnel, following this up later in the decade with a massive study of post-traumatic stress disorder in Vietnam War veterans. The study concluded that 15 percent of veterans suffered from PTSD—a condition frequently seen today in soldiers returning from Iraq and Afghanistan.



Technology Transfer for NASA

Photos of the space shuttle show improved clarity with technology called velocity interferometry system for any reflector imaging—among the many technologies RTI has helped NASA spin off to the commercial sector. RTI also helped NASA spin off space-suit cooling technology to prevent heat stroke in race-car drivers and to maintain body temperature in victims of spinal-cord injuries. Opposite, European Space Agency astronaut Christer Fugelsang is well-protected by his suit during a spacewalk at the International Space Station in 2006.

When the United States created the National Aeronautics and Space Administration one year after the launch of *Sputnik 1*, the government required that NASA's technological breakthroughs in aeronautics, material design, miniaturization, and computers be adapted for the public's benefit. RTI helped fulfill this mandate, transforming space science into a range of new products and services.

A team of RTI scientists sought candidate NASA technologies to be spun off by the private sector into practical applications. They called themselves the Biomedical Applications Team, or the BAT team. BAT became TAT, for Technology Applications Team, in the late 1970s. Led for many years by future RTI president Tom Wooten, the team adapted technologies developed for spacecraft into an implantable insulin-delivery device for managing diabetes and other chronic illnesses. It also transformed the control mechanism of NASA's lunar rover to help physically handicapped people drive a vehicle via a single-stick device that controlled direction, speed, and braking.

RTI also developed "cool suits" derived from the garments of astronauts for people without sweat glands or those who have been paralyzed. The suits help prevent heat stroke, a common ailment among the paralyzed. "We work with companies and organizations like the Paralyzed Veterans of America and with burn surgeons. We listen to what they need, then we write up a problem statement and submit it to NASA engineers for a possible solution," explains Doris Rouse, who directed RTI's technology transfer work in the 1980s and 1990s. Private-sector clients have included Lucent Technologies, Lockheed Martin, Kraft Foods, and Tenneco.

In 2006, RTI led efforts to identify potential markets for emulsified zero-valent iron (EZVI), developed at Kennedy Space Center to remediate groundwater pollution. EZVI successfully treats halogenated solvents, notoriously stubborn chemical contaminants that sink through soils and into aquifers, offering a tremendous improvement over past remediation methods. As a result of RTI's collaborative efforts with NASA, EZVI is now available on the market from five licensees. The technology holds great promise in the cleanup of hundreds of contaminated sites across the country, including more than half the sites on the Superfund National Priorities List.

Doris Rouse led RTI's efforts to help NASA commercialize space technology for two decades.

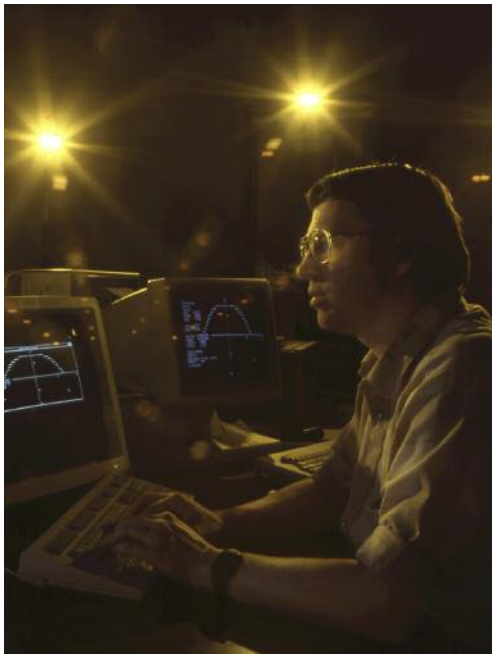
Named for Marcus E. Hobbs, Duke University chemistry professor and then-chairman of RTI's executive committee, the Hobbs Building houses international development and social science researchers.

A decade that had begun with layoffs ended with a staff of nearly 1,500 people—400 more than in 1980—an astonishing metric for Herbert, RTI's first employee, who had once shared "headquarters" with Bill Perkins and a secretary.

with Bill Perkins and a secretary. Equally impressive was Research Triangle Park. Scrubland when Herbert first stood in it, the park now boasted 54 corporate, academic, and government occupants whose combined payroll included more than 32,000 employees.

Herbert's longstanding goal to increase private-sector business had also achieved some success, growing from $1.5 million in 1980 to $7.7 million in 1988. The institute provided a wide range of services to more than 120 companies (34 in North Carolina), from energy firms to agrichemical companies to consumer products giants.

While many factors over the years contributed to RTI's success, Herbert often said the most important was reputation. Scientists the world over had made the journey to North Carolina to become a part of RTI, cognizant that the institute presented abundant resources to attack the world's problems—not in a vacuum but in collaboration with other scientists impelled by the same cause. RTI, they learned quickly, was a great place to work. Through the years the staff's focus on quality, scientific integrity, and high ethical standards in the conduct of research programs brought the institute recognition and renown. As Herbert once put it, "There are several fine research institutes older and larger than RTI, but none surpasses RTI's reputation for professionalism, objectivity, and the highest standards of performance and ethics."

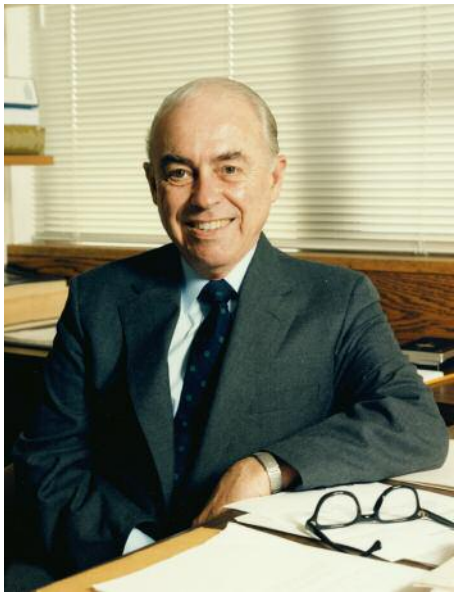


Herbert had liberated staff members to develop their own scientific interests and market them accordingly, a decision not lost on his top lieutenants. "Projects were neither dictated nor assigned by top management," says Dan Horvitz. "It was an operating mode that attracted and retained capable, creative researchers, and it paid off in continuing work."

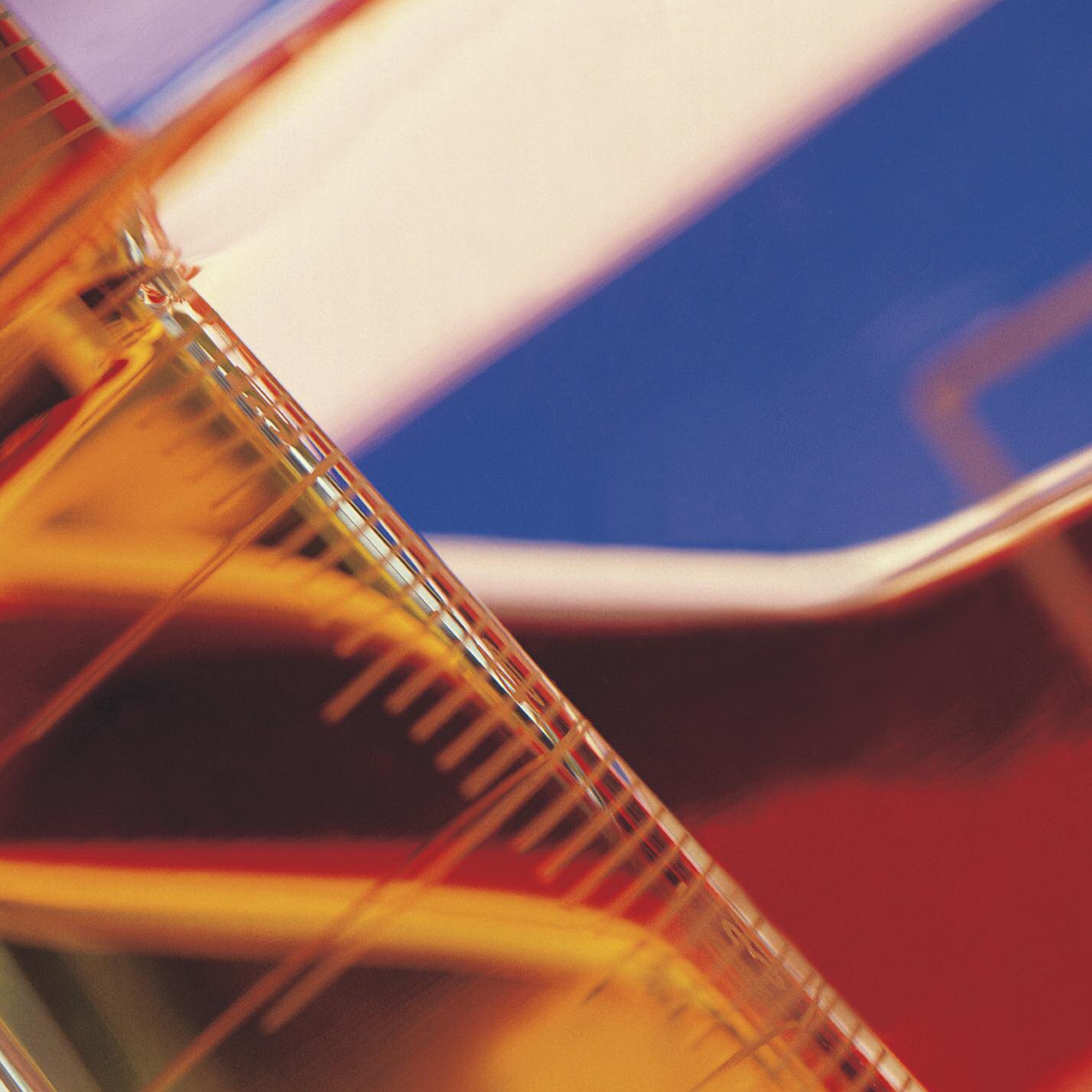
Ivy Carroll concurs: "George created a flexible work atmosphere where you were expected to do a lot, but you wouldn't be tied down as one would be in a corporation. As long as I kept bringing in projects and did things ethically and within the goals of RTI, he didn't bother me; he just clapped his hands."

Herbert stayed on as vice chairman of the Board of Governors, continued for a brief spell as president of MCNC, and helped Tom Wooten through the transition. Herbert told *North Carolina* magazine that, in his spare time during retirement, he would tend "the annoying number of plants" he and his wife Lois Anne had at their home.

On January 14, 1995, at the age of 72, George Herbert passed away, survived by his wife, five children, and eight grandchildren. "The hallmark of George was his integrity, not just in dealing with the staff but in terms of dealing with the board and the community," says Wooten. "Many people here, myself included, stayed on at RTI when we had a lot of good job offers elsewhere. The reason was George. He was a leader."



After leading RTI for 30 years, George Herbert, above, passed the baton on to Thomas Wooten in 1989. Also in the late 1980s, RTI built a solar simulator for NASA Langley Research Center to evaluate the effect of sunlight on cockpit displays, which RTI developed for NASA. RTI's Harold Lane, left, examines the system's controller.



CHAPTER FIVE

The World Gets Smaller

In the 1990s, RTI's singular goal to improve the human condition was codified as its mission and was abundantly evident in the institute's basic research in environmental microbiology and aerobiology, left. Biological contaminants like bacteria, fungi, viruses, protozoa, and algae are linked to a variety of adverse health effects, such as asthma, allergies, digestive problems, and infectious diseases.

"Tom followed George's philosophy, which was to let scientists from the bottom up suggest areas of opportunity and then liberate them as true entrepreneurs to chase that business."

New RTI President Thomas Wooten, right, continued his predecessor's strategic course, noting in a memo, "We will, of course, continue to look for ways to improve our operations and insure our continued success, but some things should never change. One of these is emphasis on excellence. RTI's reputation for quality in research is, in fact, the combined reputation of each staff member."

Tom Wooten had both the organizational skills and scientific credentials to lead RTI into the 1990s. An engineer, he had managed the Biomedical Applications Team for seven years and was one of the institute's ten vice presidents following the 1983 restructuring, managing electronics and systems.

Wooten was George Herbert's handpicked successor, and he stayed true to his predecessor's strategic course. "Tom followed George's philosophy, which was to let scientists from the bottom up suggest areas of opportunity and then liberate them as true entrepreneurs to chase that business," says Edo Pellizzari. As Wooten once wrote, "When you become a manager, your own success depends on the success of others."

His second-in-command was Alvin Cruze, who had succeeded Dan Horvitz as executive vice president in 1989. "We felt having an engineer in Tom and an economist in Al was a good way to top the organization," explains Phail Wynn, Ph.D., who joined the institute's board of governors in 1983 and, after 27 years as president of Durham Technical Community College, is now Duke University's vice president for Durham and regional affairs.

All the research operations reported to Cruze, while he and the administrative offices reported to Wooten. The two men worked together closely. "Al's skill sets were different from mine, and he could offer some insights that I didn't have," says Wooten. "When I became president, we sat down and talked about the issues we needed to work on. The key word is *we*."

Both men understood that the institute's strength was its multidisciplinary nature—its ability to commandeer an expanse of scientific disciplines to respond to urgent priorities like medical care, environmental protection, public health, and technology.

"To Enhance the Quality of Human Life and Living"

The vast range of projects in progress shared a similar purpose—to enhance the quality of human life and living. For example, when national anxiety surfaced over reports of pesticide residue on fruits and vegetables, the Food and Drug Administration retained RTI to develop systems for measuring the residues.

In the 1980s, the Food and Drug Administration established safe limits governing residues on fruits and vegetables from more than 300 pesticides. FDA turned to RTI to develop a cost-effective, efficient, and accurate way to measure the residues. RTI developed enzyme immunoassays for the purpose.


1B

Using a sophisticated process involving proteins, enzymes, and antibodies, researchers developed a nontoxic application that changed color in the presence of a pesticide. The intensity of color indicated the amount of pesticide present.

When "bad" cholesterol was pinpointed as a contributor to atherosclerosis, RTI was contracted with to study the effectiveness of lovastatin, a new drug used to inhibit the production of cholesterol by the liver. Lovastatin became the first statin approved by FDA. When concerns over the effect of pollutants on heart disease intensified, EPA retained the institute to develop a personal heart monitor to test the effects of pollutants on cardiac functions. The device ultimately was licensed to a health care products firm to record heart responses noninvasively. When methadone entered widespread use as a treatment for heroin addiction, RTI conducted the longitudinal Methadone Enhanced Treatment study for the National Institute on Drug Abuse, evaluating the needs of hard-core drug users, the extent to which they were being treated with methadone, and how to make this treatment more effective. The institute ultimately defined methadone performance indicators to effect better treatment outcomes.

Stopping the Craving to Get High

Substance abuse research also grew during the decade. In 1992, RTI conducted its largest-to-date National Household Survey on Drug Abuse for the federal Substance Abuse and Mental Health Services Administration (SAMHSA)—providing data on substance abuse trends and other information useful to health care, law enforcement, and government officials. The national-sample study posited that 11.7 million

Evaluating the efficacy of new drugs and treatments is an RTI core competency. Before lovastatin was approved by the Food and Drug Administration to prevent heart attacks, opposite, RTI was contracted with to determine the drug's value. RTI also has evaluated the effectiveness of methadone treatment programs, above, for the National Institute on Drug Abuse.

RTI engineer Robert Beadles and his daughter Elena, who is hearing-impaired, practice cued speech, above, which RTI automated with the Autocuer. RTI engineer Blake Wilson, opposite, developed much of the speech processing technology inside the cochlear implant, a surgically placed device that provides a sense of sound for the deaf and hearing-impaired. RTI's relationship with its founding universities played a part in the device's development. As Tom Wooten recalls, "When we started the project, we realized we needed another electrical engineer. I called one of our colleagues over at Duke's engineering school and said we needed an engineer. That's how Blake Wilson came to us."

Reaching Out to the Hearing Impaired

In the 1970s, many children stricken with deafness before the age of three never fully learned their native language. As a consequence, many of these children developed intellectual and emotional challenges and feelings of profound alienation from others. Research by RTI would help change the paradigm.

In the mid-1960s at Gallaudet College for the Deaf, a federally chartered college for the deaf and hearing impaired, Orin Cornett, Ph.D., had developed a technique called cued speech, in which simple hand signals combined with lip-reading made spoken English comprehensible to a deaf child. RTI engineer Robert Beadles and his hearing-impaired daughter, Elena, eagerly learned the cued speech system. Then, in 1971, Beadles brought RTI into groundbreaking research with Cornett to turn these manual cues into automatic ones. Four years later, the research culminated in the Autocuer, a wearable instrument that processes speech and provides visual cues to supplement lip-reading. The organizations had jointly developed the device on behalf of private and public sector sponsors, including NASA, the National Institutes of Health, and the Veterans Administration.

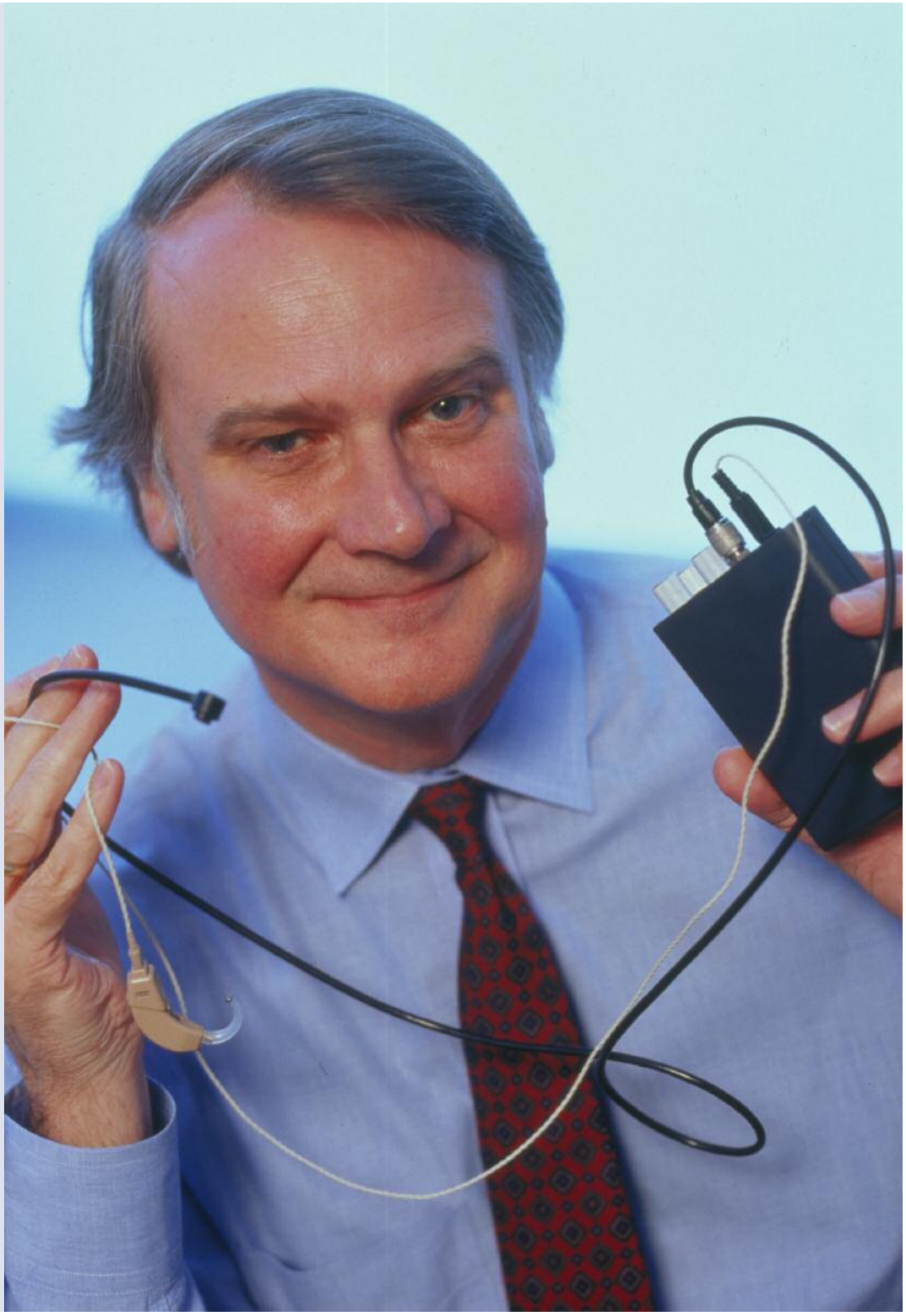
The first deaf person to test the Autocuer was two-

year-old Leah Daisey, whose mother later wrote, "Our deaf child was learning language and becoming a truly participating member of [the] family. Cued speech worked." Another fifteen years passed before the device was licensed for commercial production.

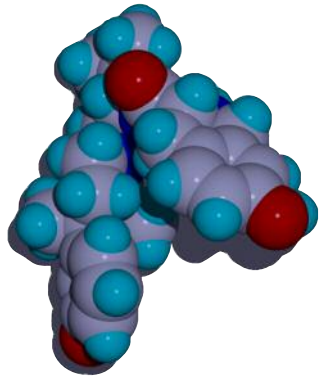
As originally conceived by Beadles, the Autocuer was a pair of computerized eyeglasses displaying virtual images analogous to hand symbols produced by a microcomputer. The microcomputer analyzed speech received from a microphone located on the frame of the eyeglasses. In 1987, Power International, Inc. acquired licensing rights to the Autocuer and funded a redesign of the laboratory prototype. In 2001, the Massachusetts Institute of Technology was awarded a patent for a computerized autocuer based, in part, on the technology developed by RTI and Gallaudet.

Another important innovation vastly improving communication for the deaf and hearing impaired was the development of cochlear implant devices, which were surgically implanted inside the inner ear. Unlike hearing aids, cochlear implants do not amplify sound; instead they use implanted electrodes to directly stimulate functioning auditory nerves carrying speech to the brain. External components of the cochlear implant include a microphone, speech processor, and transmitter, which permit users to adjust the sound for quality and amplitude.

The institute initiated research into cochlear implant technology in 1978. Six years later, the U.S. Food and Drug Administration approved an Australian cochlear implant device providing near-normal levels of speech recognition. RTI researcher Blake Wilson, now at Duke University, is credited with inventing most of the speech processing strategies used in the original and subsequent generations of the device. (One of Wilson's papers, published in 1991 in the journal *Nature*, is among the most highly cited publications in the field of cochlear implants.) In 1997, Wilson and RTI received the American Otological Society's Presidential Citation for "major contributions to the restoration of hearing in profoundly deaf persons."



Among the dozens of patents awarded RTI over the years is one for JDTic, a pharmacotherapy to treat cocaine abuse and prevent cocaine relapse. RTI chemist Ivy Carroll is credited with developing the unique compound, whose structure is shown in the model below, as well as another with the same purpose, RTI-336. His research also helped guide the introduction of Dopascan, a diagnostic agent for patients with Parkinson's disease. Carroll's achievements earned him induction into the American Chemical Society's Division of Medicinal Chemistry's Hall of Fame in 2007, among the highest accolades a scientist can receive. A hallway in the George Watts Hill Building, opposite, displays the many patents awarded RTI.



Americans were illicit drug users, marking a significant decline from the 24 million drug users reported in 1979. While marijuana usage rates remained high, the 1992 study showed that cocaine usage had dropped to 1.3 million users from 5.3 million users in 1985.

The survey became an annual, widely followed benchmark, and RTI conducted nine follow-ups through 1998, the sample sizes increasing steadily. In 1999, the methodology was changed from a national sample to a 50-state design, and in 2001 the name of the survey was changed to the National Survey on Drug Use and Health (NSDUH). Since 1999, approximately 700 RTI field interviewers have conducted some 67,500 interviews across the country every year; RTI has a contract to continue the annual surveys through 2009.

NIDA and RTI also teamed up in the 1990s to better understand the biochemical mechanisms of cocaine addiction to guide the development of treatment medications. Leading this work at the institute was Ivy Carroll, in collaboration with Michael Kuhar, Ph.D., at NIDA's Addiction Research Center. Kuhar had identified brain receptors accounting for cocaine addiction, and he and Carroll teamed up to design and synthesize various compounds as potential pharmacotherapies. Carroll's research culminated in the development of RTI-336, a compound synthesized in 1993 and subsequently patented. "RTI-336 is an indirect dopamine agonist therapy, a compound that provides some of the rewarding properties of cocaine but not all of them," Carroll explains. "Part of cocaine's abuse potential is the rush people get due to a fast onset of action, but the effect crashes after about 30 minutes and leads to bingeing. RTI-336, which has a slower onset and longer duration of action, will not possess this attribute of cocaine's properties."

Pre-clinical studies of RTI-336 in animals progressed successfully, and RTI, in a cooperative agreement with NIDA, is seeking FDA approval to begin clinical trials in humans. "Things move painfully slowly in this business," Carroll says.

Diagnostic Tool for Parkinson's Disease

Another synthetic compound to fight cocaine addiction proved its merit elsewhere. A cocaine analogue named RTI-55 showed tremendous potential as a diagnostic agent for people suffering from Parkinson's disease, a disorder of the nervous system that initially causes uncontrollable trembling and eventually interferes with muscle activity throughout the body. The disease occurs when brain cells that produce an essential chemical messenger, dopamine, begin to die in large numbers. "The only diagnostic technique for Parkinson's in the early 1990s was a clinical examination, and it was very difficult for physicians to determine whether the symptoms were in fact Parkinson's and not other types of central nervous system disorders," says Carroll. "The exam was not foolproof, and yet early detection is critical since you can slow Parkinson's progress with preventive drugs."

RTI-55 changed the picture by identifying the absence of dopamine-producing neurons in the brain, a condition very suggestive of Parkinson's and not other disorders of the central nervous system. When combined with a radioactive label, the compound binds to neurons that play a central role in regulating the amount of dopamine in key parts of the brain. Once RTI-55 is in the brain and is detectable by medical imaging, physicians can see if it accumulates in those parts of the brain that normally have large numbers of dopamine-producing neurons. Lack of these dopamine neurons is strong evidence that the person has Parkinson's disease. Marketed as

Dopascan and Iometopane, the diagnostic agent is in wide use around the world today.

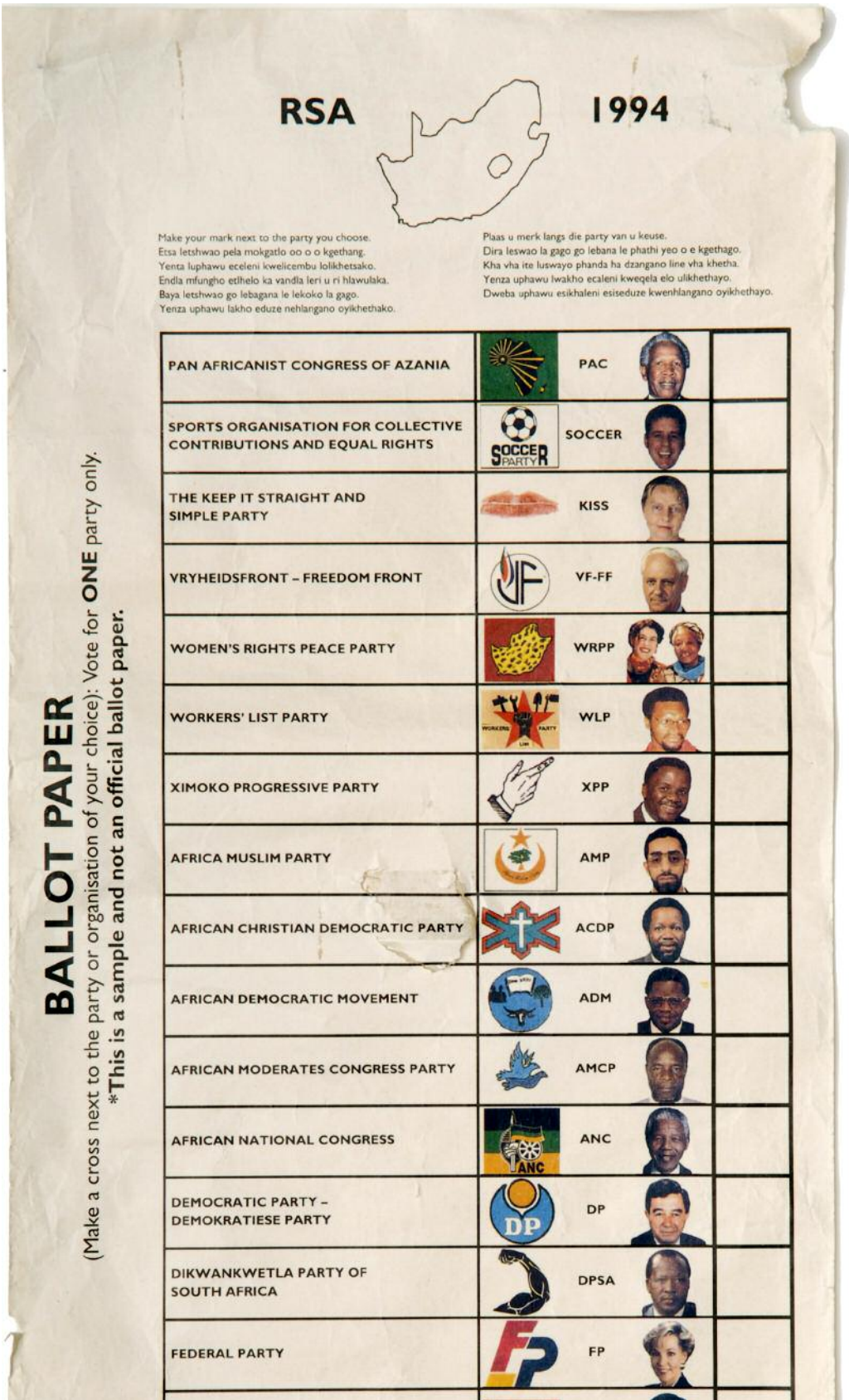
A Mission Statement Is Adopted

While this vital health care research was under way, RTI was engaged in diverse multidisciplinary projects in toxicology, education, international development, alternative energy, and dozens of other research areas. This work fell under 29 distinct research units, each posting remarkable scientific achievements.

Everything that RTI did had at least one thing in common—the goal of improving the human condition. After decades without a mission statement per se and hints of "many missions," "quality-of-life" research, and the institute's "ability to respond to national problems," Wooten and his management team put it into words in 1993:

> *RTI is dedicated to improving the human condition through multidisciplinary research, development, and technical services that meet the highest standards of professional performance.*

The wording of the mission statement changed slightly in succeeding years, but its core meaning remains the same.



RTI has worked in South Africa since the early 1990s, implementing dozens of projects in municipal finance, health, HIV/AIDS, local governance, and the assessment of education in a post-apartheid environment. Right, a ballot from the first multiracial elections in South Africa, held in 1994.

Best Practices in Health Care

A diverse portfolio of health care research proliferated during the 1990s. Legacy projects like the Special Supplemental Food Program for Women, Infants, and Children and NSDUH enjoyed repeat contracts. With regard to the latter, RTI conducted the fifteenth survey in 1994, which entailed more than 17,500 interviews. The same year, the institute undertook its fifth survey of military personnel regarding their drug and alcohol use. New questions were asked about health behaviors, such as exercise, stress, tobacco use, sexual practices, and the wearing of seat belts. For the first time, the survey also included a special section on female soldiers' health issues and concerns.

New projects beckoned. When Congress ordered the Department of Health and Human Services' Agency for Healthcare Research and Quality to identify the best and most appropriate health care practices based on available information on a specific disease, it was a tough assignment: the data was voluminous and often conflicting, frustrating even the best efforts of the medical community to make sense of it. Given the institute's solid reputation for health care research, it was not surprising that RTI, in collaboration with UNC-Chapel Hill, was selected in 1997 as one of only twelve evidence-based practice centers to help fulfill the congressional mandate.

Each evidence-based practice center was charged with reviewing and analyzing the relevant scientific literature on selected medical topics and then developing evidence reports on how best to manage specific treatment decisions. For example, the RTI-UNC evidence-based practice center was assigned to develop an evidence report on the pharmacotherapy of alcohol dependence, essentially evaluating the efficacy of

RTI's work in human health affects people of all ages, from infants to adults. The institute's projects in health care proliferated during the 1990s. With UNC, RTI became an evidence-based practice center, working for the Department of Health and Human Services to identify appropriate health care practices. Kathleen Lohr, an RTI Distinguished Fellow, right, is founding director of the practice center. Her RTI colleague, Loraine Monroe, at left, assists with the production of evidence reports.

In conducting the first National Survey of Child and Adolescent Well-Being, a critical question was: "Are children and families getting the services they need from child welfare agencies?"

treatments for alcohol-dependent patients. In succeeding years, the center would tackle other health issues, such as management of preterm labor, dietary changes to reduce cancer risks, speech and language disorders causing disability, and the use of aspirin to prevent heart attacks, among other studies. The center's multidisciplinary team, directed by Kathleen Lohr, Ph.D., an RTI Distinguished Fellow, drew from several research units at the institute and five health sciences schools at UNC.

Close Look at Child Welfare

Far-reaching social services research also was undertaken. RTI conducted the first-ever survey of the child welfare system in America. The

"When child abuse or neglect happens, no one wants to talk about it. No one thought [the study] could be done. Fortunately, we were accustomed to dealing with massive data collection on sensitive topics."

impetus for the study was the concern that economic tensions in families, created by welfare reform, could increase child abuse and neglect. In 1996, Congress charged the Administration on Children, Youth, and Families (ACYF, now the Administration on Children and Families) to fund the six-year National Survey on Child and Adolescent Well-Being study, which has been extended and is still under way today. The task before the institute was overwhelming. "Small local studies had been done in the past that were not sufficiently large to generalize beyond the local community or county, but nothing of the magnitude ACYF needed," says Kathryn Dowd, Ph.D., the project's director. "When child abuse or neglect happens, no one wants to talk about it. No one thought [the study] could be done. Fortunately, we were accustomed to dealing with massive data collection on sensitive topics."

Dowd and her colleagues invested two years designing the intricate survey. A sample of 5,500 children from birth to 15 who were being served by 97 child welfare agencies across the country would be surveyed. The youngest children, five-year-olds, were asked relatively benign questions about friends and school, but as the children aged, questions in repeat interviews involved greater complexity and sensitivity. "We also interviewed caregivers about the children under their care—how they were progressing and getting along with others and the resources available to them," Dowd says. "We also asked questions of child welfare caseworkers investigating allegations of abuse and neglect and surveyed teachers and day care providers by mail."

The data provided an unprecedented view into these children's physical and mental health, social and behavioral competence, cognitive and academic skills, delinquent behaviors, substance abuse, experiences of maltreatment, and other exposures to violence. Additional data captured caregivers' parenting attitudes, as well as the quality of services provided by welfare agencies. ACYF has made the data available to more than 100 research groups nationwide for analysis to inform policy decisions. Among the findings was that lack of supervision was the most common reported form of maltreatment. Researchers also found that, despite tremendous need, many children received few, if any, services. The fourth follow-up of the sample group was completed in 2008. RTI researchers have launched a new study, which is scheduled to continue into 2011 with a sample of children and families who were investigated for child abuse and neglect in 2008.

Wooten Retires

In 1998, Tom Wooten announced his plans to retire. Al Cruze succeeded him on an interim basis while the board of governors searched for a successor. Wooten had pursued an agenda at RTI that picked up where his predecessor had left off. Under his leadership, the institute's scientific stature amplified, corporate resources increased, and projects grew more scientifically diverse. Wooten also had guided RTI through another wrenching change in federal priorities for research.

The end of the Cold War not only had shifted priorities, it created new competitors for RTI. Traditional defense contractors and national laboratories sought to diversify, bringing pressure on independent research institutes such as RTI to become as cost-effective as possible. By the late 1990s, RTI had positioned itself to compete with all comers, setting the stage for significant growth to come.

A decade earlier, George Herbert had intimated to the board of governors that he might not retire if they selected someone from outside the organization to lead it. This time around, the board was resolved to do just that. With an eye toward significant growth in the new millennium, the board began a global search for a new president and CEO—someone who would blend a strong scientific background with proven leadership skills and a strategic vision.

Guiding Technological Advances in Survey Science

RTI is among the world's leaders in the design and administration of comprehensive, detailed surveys. Until the early 1980s, the institute conducted sample surveys solely by having respondents fill out paper questionnaires. Typically, an RTI interviewer would either visit respondents at their homes or telephone them and then record their responses on paper forms. Other times, the respondent would fill out the forms at home and mail the finished survey back to RTI for data entry. Unusual or illegible answers in a completed survey often required their deletion, reducing the quality of the survey data. Also, data collection required several phone calls and visits—not the most efficient way of assembling data. RTI had a better idea.

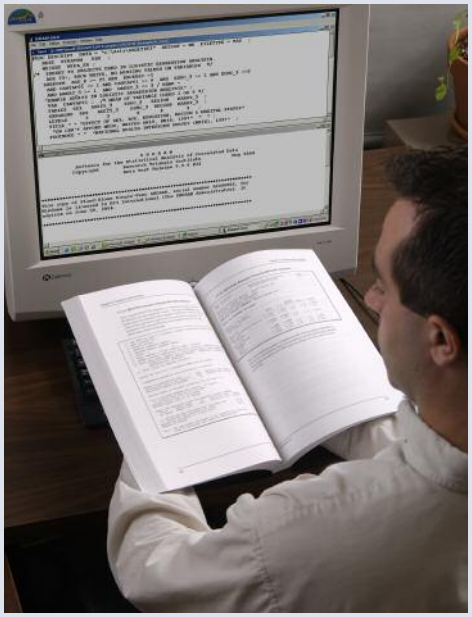
In 1983, beginning with the Department of Defense-funded Youth Attitude Tracking Study, which assessed the attitudes, motivations, backgrounds, and career preferences of young men and women in the military, RTI wielded a new interview tool developed by a team of institute computer programmers and survey specialists. It was called CATI, for computer-assisted telephone interviewing. With CATI, survey responses were keyed into a computer, helping interviewers collect higher-quality data efficiently and accurately.

Here's how it worked: Questions were displayed on the computer monitor. The interviewer read each question aloud to the respondent as it appeared and then typed in the response on the keyboard. The incidence of missing or inconsistent data was greatly reduced, and survey results were available much sooner than was possible with a conventional telephone survey.

A decade later, RTI introduced another new methodology in household survey interviewing techniques. With the 1995 National Survey of Family Growth, institute researchers deployed both CATI and a new technology that responded to the sensitive nature of the questions asked. The survey sought to shed light on the quality of health services and health education provided to pregnant teenagers, on concerns among women about cancers of the reproductive organs, and on the needs and concerns of mothers working outside the home who needed child care. RTI researchers interviewed 10,400 women of childbearing age across the country; many questions involved respondents' past and current drug use and sexual habits. The new interviewing technology, developed by Judith Lessler, Ph.D., James O'Reilly, Ph.D., and Charles Turner, Ph.D., was called ACASI, for audio computer-assisted self-interviewing.

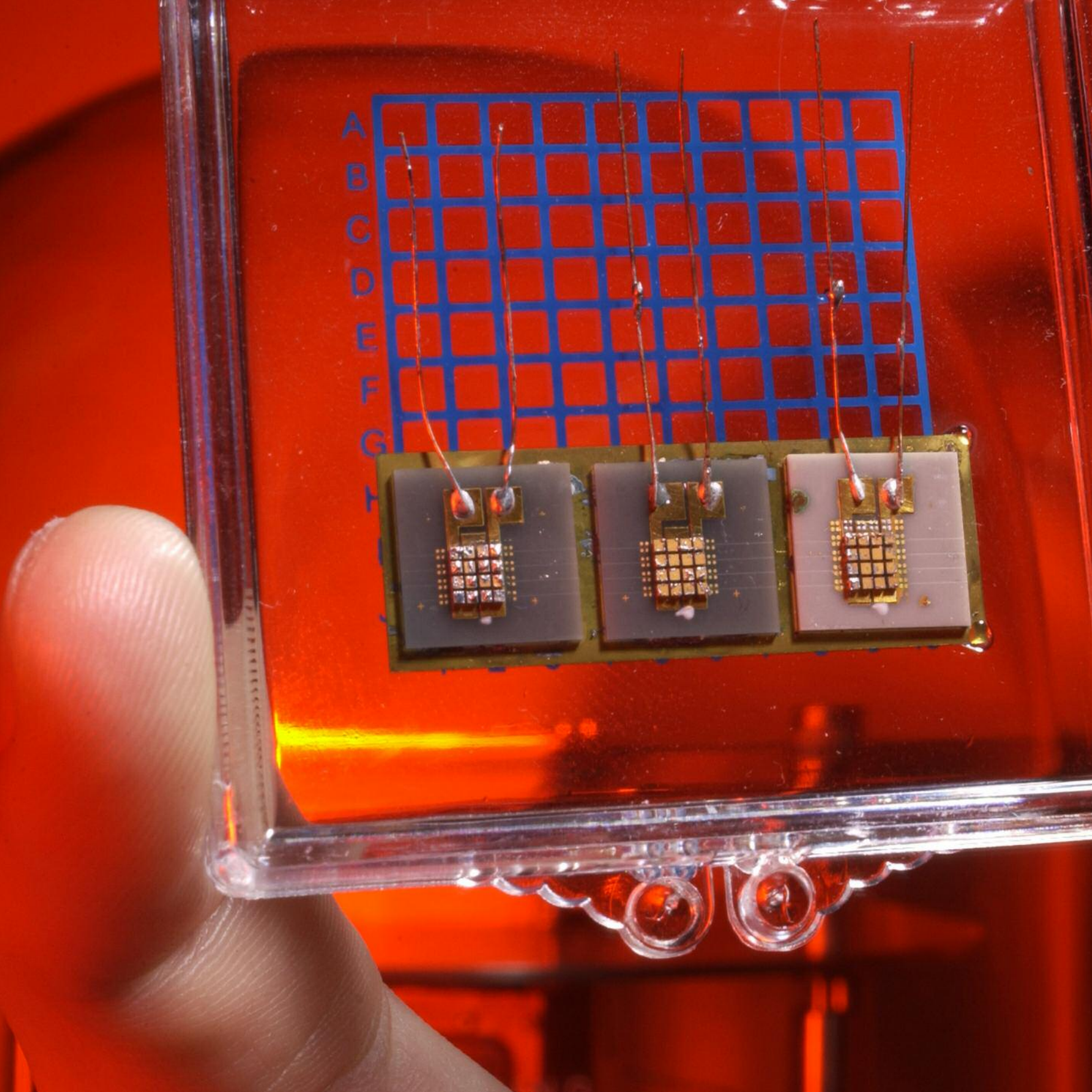
With ACASI, a computer plays recorded questions, along with answer choices, to the respondent in a private setting over headphones. The subject responds on the computer's keyboard. The computer records the response and, based on the answer, selects and plays the next appropriate question. The system provided comfort for respondents in answering sensitive questions, such as whether or not they had had an abortion. Data on abortion was underreported in the United States by as much as 50 percent, according to fertility surveys at the time; ACASI helped provide more accurate and detailed survey data for study by health care policymakers.

From RTI's inception, statistical science, sampling, and surveys have been a research hallmark. Early efforts primarily involved door-to-door surveys, right. In recent years, RTI has developed sophisticated methodologies for analyzing complex survey data. They include SUDAAN (software for the statistical analysis of correlated data), opposite left, and ACASI, audio computer-assisted self-interviewing, opposite right.



ACASI subsequently became the preferred methodology in survey and policy research involving highly sensitive topics, from health care and eating habits to substance abuse and sexual practices. In 1997, RTI unveiled the latest iteration of the technology—touch-screen self-administered interviewing. Rather than listen to questions over a headset, the respondent simply reads them on a computer and touches the appropriate response on the screen.

RTI's technological leadership in survey methodology is not limited to interviewing. In 1984, the institute introduced SUDAAN, the first statistical software created to analyze correlated data collected from complex surveys. The institute's biometrics chief scientist, Babubhai V. Shah, Ph.D., led the team that developed SUDAAN, which quickly became the standard tool in the profession; it remains a valuable resource today, the tenth version having been released in 2008. Shah named it SUDAAN for two reasons—a shorthand acronym for "survey data analysis" and because the word, in Sanskrit, means "beautiful gift."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CHAPTER SIX

Transformation for Tomorrow

RTI is at the leading edge in the use of thermoelectric superlattices, opposite, to generate electrical power from heat sources. RTI's projects include one for the Defense Advanced Research Projects Agency to meet ambitious goals for power sources that a single individual could carry. DARPA is funding R&D of radical new approaches to energy that are well beyond the capabilities of present-day or future batteries. Education is the focus in Cambodia, where RTI is helping modernize the country's curriculum. In Ratanakiri province, left, students harvest mushrooms during an after-school life skills program.

"Other research institutes had become more international, had grown through acquisitions, were commercializing their intellectual property and finding new sources of commercial revenue. We needed a leader who could put us on that path, someone with keen business instincts."

In searching for Tom Wooten's successor, RTI's board of governors found what it was looking for in Victoria Franchetti Haynes, Ph.D.—an individual with a strong research background and sharp business skills. Haynes, a chemist, was the chief technical officer and vice president of the technology group at aerospace and specialty chemicals company BFGoodrich (now Goodrich). She understood the need to spur the institute's revenue growth, shaking up the status quo while nurturing what was best about the organization.

As board member Bill Little explains, "Other research institutes had become more international, had grown through acquisitions, were commercializing their intellectual property and finding new sources of commercial revenue. We needed a leader who could put us on that path, someone with keen business instincts."

Board Chairman Earl Johnson Jr., who is also chairman of Southern Industrial Constructors, says the search committee pared the list of suitable candidates from 50 to three. Haynes got the assignment. "She had a strategic vision, energy, and charisma, and she understood research and the need to commercialize RTI's intellectual property," board member Phail Wynn says. "She also had real solid industry ties and a strong business background."

What convinced Haynes to take the post, she says, was RTI's mission of improving the human condition. "It just resonated well with who I am," she says. "This is a research-based organization, and deep down I'm a scientist. I also was attracted by the multidisciplinary depth of the institute—researchers in more than 125 disciplines—and began thinking about how to pull them together to attack very large issues and problems that are global in nature." Haynes

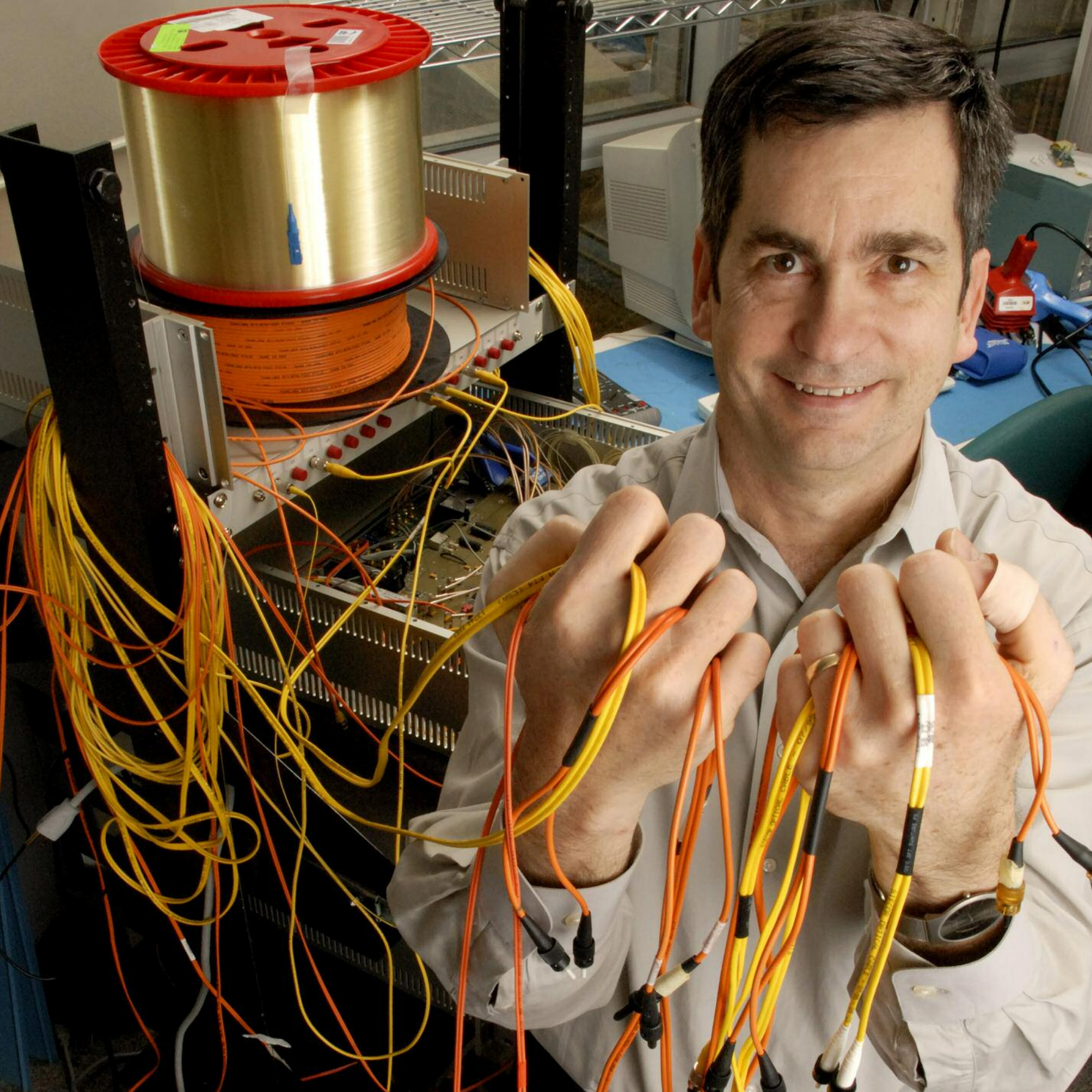
started work as RTI's president and CEO on July 1, 1999.

A New Emphasis on Business

Haynes grasped the main challenge before her: the need to transform RTI into a modern business organization while building its scientific stature and maintaining a commitment to RTI's mission. She hit the ground running. In succeeding years, Haynes emphasized an even more cross-disciplinary approach to projects and invested extensively in human capital, bringing new scientists and new capabilities to the institute. She also increased expenditures on the physical plant and equipment, engaged in several acquisitions and spinoffs, and established systems to commercialize the institute's intellectual property, or IP.

Haynes also made the decision to fully involve the finance organization as her strategic partner in decision making to ensure a business-minded approach to projects. Much like George Herbert had depended on Bill Perkins to create the original business infrastructure at RTI,

Victoria Franchetti Haynes, opposite, became RTI's president and CEO in 1999. Haynes, a chemist by training, pushed RTI to become more of a modern business organization while growing the institute and enhancing its scientific stature. Above, researchers Stephen Cooper and Brenda Fletcher work in a new laboratory in the $20 million Earl Johnson Jr. Science and Engineering Building on RTI's campus.



Haynes relied on Jim Gibson, the institute's new chief financial officer, to develop a modern finance organization. Gibson, who is also an attorney, had worked in the finance departments at Hughes Aircraft Company and Rockwell. He succeeded Perkins, who retired after a 41-year tenure. "My experience in the corporate world taught me that the CFO is the president's best friend, someone who can help you understand the financial impact of decisions," says Haynes.

One of Haynes' first decisions was to more fully involve the board of governors in the institute's strategic direction. The board had grown quite large, with as many as 35 members, and had become a ceremonial organization that ceded oversight to its executive committee. Haynes pared the number of governors to fifteen. She also encouraged the board to form active committees to provide oversight in audit, compensation, governance, and finance.

"Sitting on a Wealth of IP"

To exploit the institute's intellectual property and license its technology to others, Haynes unveiled a commercialization initiative. "We were sitting on a wealth of IP that we weren't doing anything with," she says. "We didn't have a real well-defined process for bringing inventions through the protection process and out to commercialization. That whole process—from idea to commercialization and everything in between—has been filled. We have structure now."

As part of this structure, the new president revamped the role of the legal organization to assist with the commercialization strategy. "IP is the currency on which all deals are done, fueling licenses, spinoffs, and joint ventures," explains Scott Merrell, tapped by Haynes as the institute's first chief legal officer.

Merrell revised the institute's disclosure processes and developed plans to financially value and legally protect IP. "One of Victoria's strengths is that she challenged all of us to think about better ways of doing things," he says. "She realized the money generated from commercialization could be put back into our treasury to support our mission of improving the human condition. Victoria can run deep with the scientists, but she also has great business sense."

Projects Proliferate in the New Century

In the early years of the new century, the institute overflowed with research projects, many continuing from the 1990s. Researchers at RTI and UNC collaborated on a five-year study for the National Institute on Drug Abuse, evaluating the effectiveness of alcohol and drug use prevention programs at middle schools, as well as the curricula provided and program adoption rates. Although such programs had been around in various guises for nearly 30 years, they had not met with uniform success, and some schools persisted in using programs known to be ineffective. Released in 2002, the study helped policymakers make more informed choices about such programs in the future.

Scientists in RTI's Natural Products Laboratory continued to investigate compounds such as nitidine, derived from the bark of the African tree *Fagara macrophylla,* for antitumor activities. Their colleagues, meanwhile, sought ways to stop the transmission of malaria, the world's most debilitating disease, accounting for about 1.1 million deaths worldwide every year. Funded by the National Institute of Allergy and Infectious Diseases, Charles Sparacino, Ph.D., endeav-

RTI scientists are combining two new communication technologies—remote direct memory access and optical burst switching—as part of a research effort to permit high-speed transmission of data between computer hardware systems without the need for a software program interface. Former RTI researcher Dan Stevenson, opposite, holds fiber optic cables used to establish the hardware connections and transmit data. Stevenson has since joined RTI's spinoff siXis, Inc. as vice president of technology. Above, the exterior of RTI's George Herbert Building at night.

ored to ensure the purity of vaccines developed to stop the disease's transmission. The research focused on using analytical chemistry to improve the vaccine's assay—the procedure for measuring the biochemical or immunological activity of a sample. "Developing a cure for malaria is tough because the life cycle of the parasite responsible is very complex," Sparacino explains. "What we're doing won't cure someone who already has the disease, but it may stop transmission from organism to organism."

Other researchers collaborated with their counterparts at Duke University on a three-year study of the efficacy and safety of the herb St. John's wort as a treatment for depression. RTI served as the data management and statistical analysis center for the study, the first large-scale, multisite clinical trial of St. John's wort in the United States. Researchers studied 340 patients suffering from depression, each randomly assigned to one of three treatments—St. John's wort, a selective serotonin reuptake inhibitor, or a placebo. The study, funded in part by the National Institute of Mental Health (NIMH), concluded in 2002 that the widely used herbal remedy was no more effective than a placebo in relieving depression. The findings were published in *The Journal of the American Medical Association.*

NIMH also funded the Multisite HIV Prevention Trial, the largest randomized, controlled HIV behavioral intervention study in the United States. RTI served as the study's data coordinating center. More than 3,700 men and women in 37 inner-city clinics were enrolled in the trial to determine if their participation in HIV prevention sessions effectively reduced high-risk sexual behaviors. The findings, published in *Science,* indicated that the interventions cut such high-risk behaviors in half, validating the sessions as an effective strategy for adoption by public health organizations.

RTI's statistical science researchers participated with their colleagues in other scientific disciplines in the Multisite HIV Prevention Trial and many other studies. More than 100 statisticians were in the institute's employ at the turn of the century. They specialized in surveys, biostatistics, medical studies, and the design and analysis of experiments.

A Business Unit for Pharmaceutical Research

Drug metabolism research—determining how different drugs interact with the body's metabolic processes—had proliferated at RTI during the 1990s, helping pharmaceutical companies perform drug metabolism tests more expeditiously. In related work, the institute also helped drug makers navigate the complex clinical trials process. "No longer were safety and efficacy the only hurdles to surmount to ensure a drug's success," explains Josephine Mauskopf, Ph.D., program director for pharmacoeconomics research. "Companies now have to provide evidence of a drug's overall value, its effect on health care resource utilization, cost, social productivity, and quality of patient care."

Funded by pharmaceutical companies, the institute collected, analyzed, and interpreted diverse economic and health outcomes data. RTI also estimated the economic costs of drugs and drug compounds before they were introduced to the marketplace. "Pharmaceutical companies have to prove not only that a new drug can cure or relieve symptoms of a disease but also that the therapy is more cost-effective than other

St. John's wort, above, was inexpensive, available without a prescription, and had few side effects—but did it really work as a treatment for depression? In 1998, the National Institute of Mental Health funded a three-year study by RTI of the efficacy and safety of the herb; the study revealed that it was no more effective in treating depression than a placebo. Opposite, interns Edye Lewis, left, and Kia Lightly, students at North Carolina Central University, work in RTI's Natural Products Laboratory, searching plant material for potential pharmaceuticals.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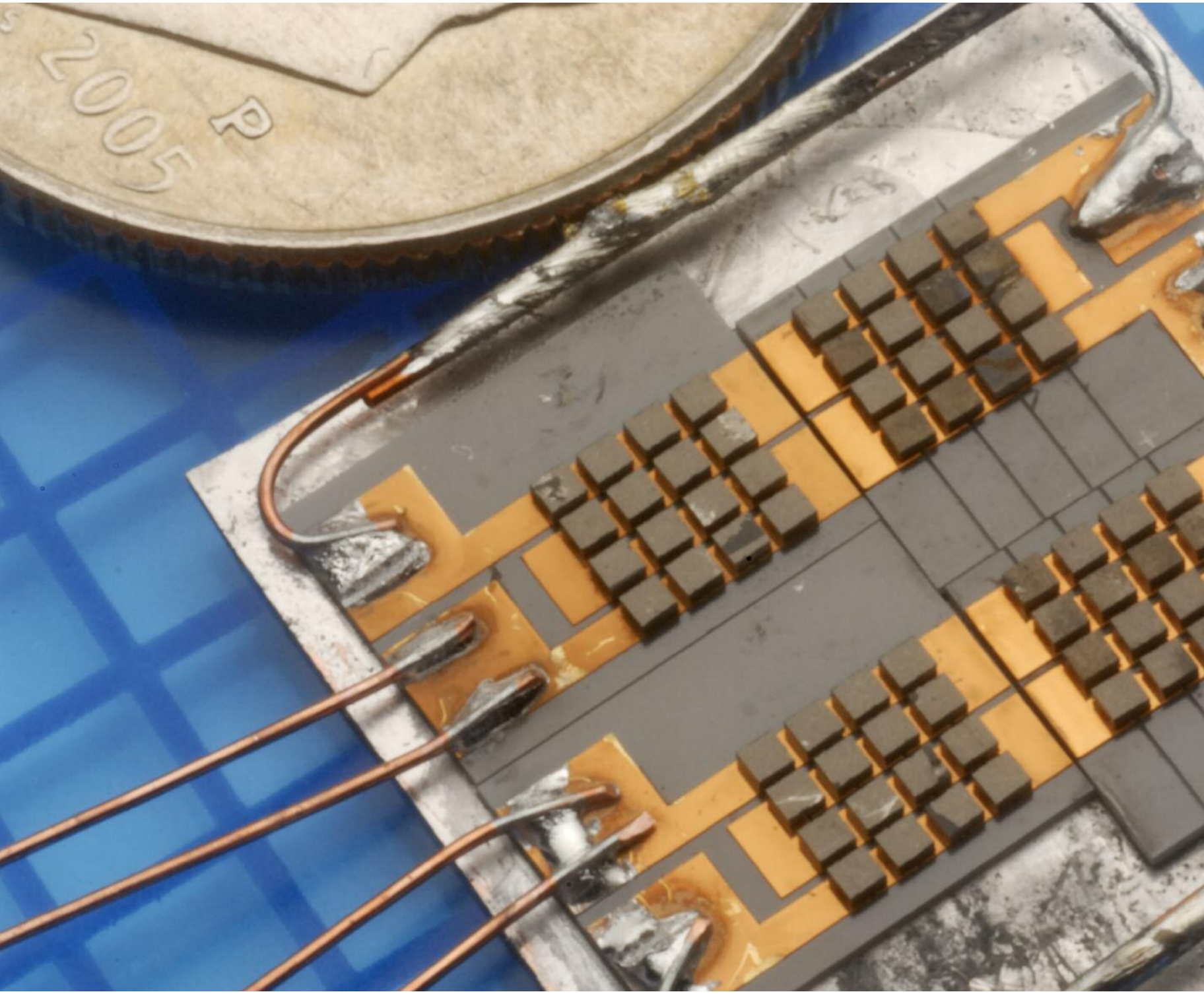
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available treatments," says Allen Miedema, Ph.D., retired vice president of Health, Social, and Economics Research at RTI. "To provide this data, we married our strengths in statistics and survey work with our strengths in health economics research, software development, conjoint analysis, and contingent valuation."

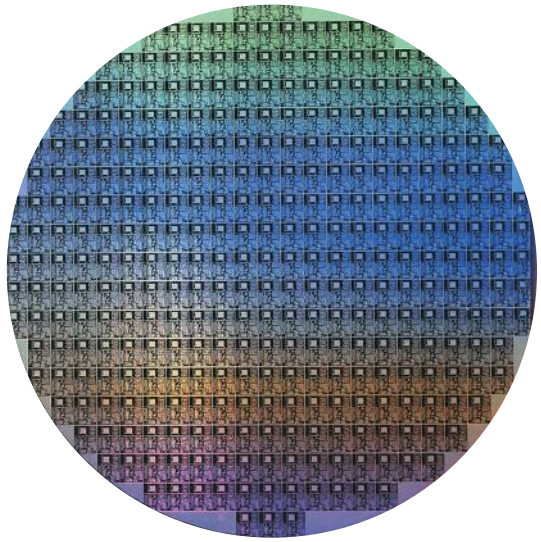
Realizing the potential of pharmacoeconomics to generate revenue from drug companies, Haynes created an independent unit, RTI Health Solutions, in October 2000 to leverage these commercial benefits.

The Birth of Ziptronix

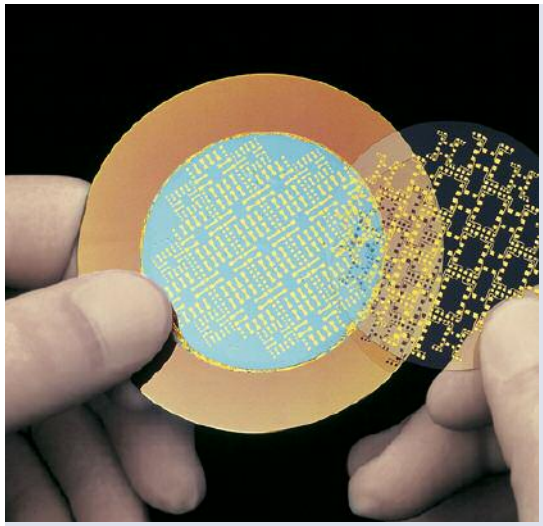
In the same month in which she launched RTI Health Solutions, Haynes made another pivotal decision: RTI spun off part of the institute's integrated circuit chip foundry into a private company called Ziptronix, Inc.

RTI had been a pioneer in semiconductor research and development, much of it funded by the Department of Defense. At the time, the custom integrated chip production facility was fabricating semiconductor wafers—the complex of electronic components and their connections that are produced on small slices of silicon and other materials. It also produced nickel-chromium resistors, metal capacitors, light-emitting diodes, and lasers for a wide range of companies and organizations.

Under terms of the spinoff, Ziptronix would build 3-D integrated circuits using RTI's patented ZIROC room-temperature, adhesive-free bonding technology. The novel process made it possible to fuse and electrically interconnect semiconductor wafers to make chips that were faster, smaller, lighter weight, and more powerful than existing circuits.



Just one square centimeter of RTI's thin-film supperlattice technology, opposite, can provide 700 watts of cooling power under a normal temperature gradient. Under a contract with General Motors, RTI is applying this technology to convert wasted heat into energy in an attempt to make vehicles more fuel-efficient. In 2000, RTI spun off its ZIROC room-temperature, adhesive-free bonding semiconductor technology into a commercial enterprise, Ziptronix, Inc., a pioneer in 3-D integrated circuits; above is one of Ziptronix's chips.



RTI's spinoff company Nextreme Thermal Solutions manufactures thermoelectric modules, above, that reduce the heat caused by hot spots in microprocessors; such hot spots often cause semiconductor chip failures. When placed directly under the hot spot, the superlattice device efficiently pumps the heat out. A penny, opposite, underscores the small size of this thermoelectric wafer. Nextreme's market comprises the electronics, photonics, biomedical, and aerospace industries.

Breakthrough in Thermoelectrics

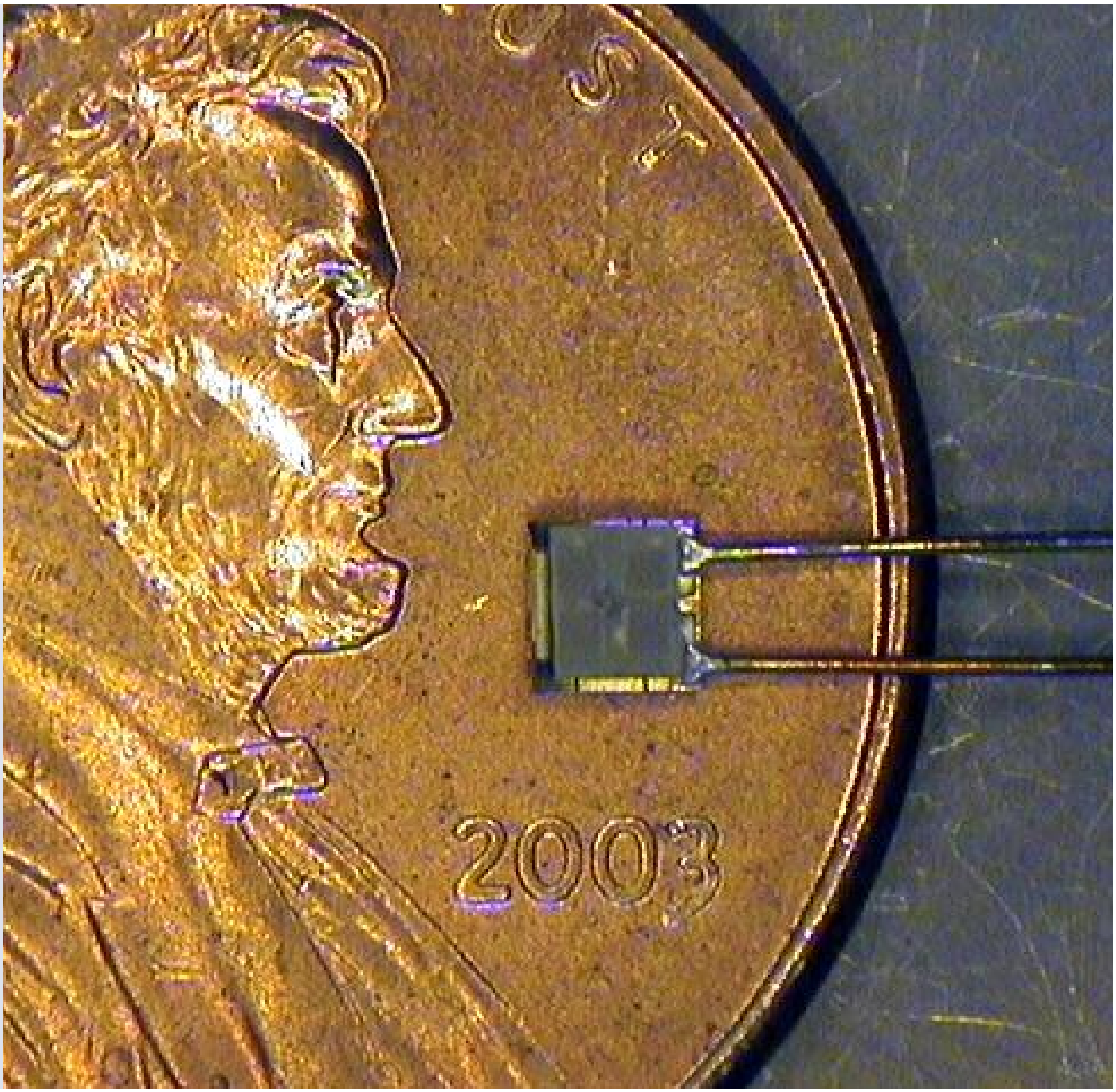
Throughout the 1990s, RTI conducted research on thermoelectricity—in which a temperature difference can produce electricity or in which an electrical input can produce cooling. This was a new field at the institute, led by Rama Venkatasubramanian, who pursued thermoelectric research after much of the scientific world had abandoned it. "The field was essentially deserted from 1965 to 1992," Venkatasubramanian, Ph.D., says. "When I was in graduate school, my advisor mentioned the lack of progress in thermoelectric research, so I went to the NC State library and started reading up on it and got interested."

He and his colleagues in the institute's thermoelectrics group not only revived the moribund research field, they pioneered the development of efficient, affordable thermoelectric devices by engineering them at the nanoscale level. "Using innovative, thin-film superlattice materials deposited via a process we patented, we developed an approach to improve the material efficiency and other aspects, such as the speed of cooling and cooling power per unit area, of thermoelectric devices," says Venkatasubramanian. RTI filed several patents for the application of this technology, developed largely while performing work funded by the Office of Naval Research and the Defense Advanced Research Projects Agency (DARPA).

In just a short time, Venkatasubramanian and his colleagues produced one of the most significant breakthroughs in thermoelectric research in 40 years—a thin-film superlattice material 2.4 times more efficient and 23,000 times faster than customary thermoelectric materials—and with 100 times the cooling power. The discovery, published in *Nature* in 2001, energized the scientific community pursuing similar nano-scale approaches and garnered RTI its first R&D 100 Award, in 2002.

The technology also addresses the thermal management needs of a wide range of industries, including electronics, photonics, biomedical, and aerospace products. Today's faster microprocessors also can leverage the technology to relieve "hot spots" that reduce reliability and lead to chip failures. "The potential enabling impact of RTI's discovery is staggering," says Valerie Browning, Ph.D., program manager at DARPA's Defense Sciences Office, which funded the research. "This revolutionary development will almost certainly improve the performance and capability of many cooling and power generation systems for DOD and commercial applications."

These developments, combined with a major U.S. chip manufacturer's early validation of hot-spot cooling, convinced RTI in early 2005 to launch a new spinoff company, Nextreme Thermal Solutions, taking its thin-film superlattice thermoelectric technology from the laboratory into commercial production. Based in Research Triangle Park, the company's 40 employees—experts in thermal management, electronics packaging, and semiconductor processing—have 33 patents pending or provisional. The company is sampling products across a wide range of applications in the electronics and optoelectronics markets.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Figuring an Election

Issues of utmost national importance continued to find their way to RTI for study and evaluation. Among them was the mistaken media call in the close presidential race between George W. Bush and Al Gore in 2000. The erroneous calls were linked to Voter News Service (VNS), a consortium that provides the results of U.S. presidential elections to the media as quickly as possible. VNS received intense criticism for initially projecting Gore the winner in the State of Florida before changing its position to Bush and then finally conceding that the election was too close to call. In December 2000, VNS contracted with RTI to review its data collection procedures and estimation methodologies. The purpose was to provide an independent scientific assessment of the causes of the mistaken calls to improve Election Day forecasting in the future.

RTI assembled a team of six senior statisticians and survey methodologists to conduct the review. The team concluded that what led to the faulty projections was a series of system errors occurring in tandem: estimations of the early absentee vote and of the outstanding vote at the end of the evening, estimator bias in the exit-poll ratio, and county-level reports. Stricter quality controls and standards, in addition to improved estimation methodology, would prevent these errors in the future, RTI advised.

The report drew national media attention. Paul Biemer, Ph.D., a member of RTI's team, testified in a hearing before Congress on the subject of election-night coverage by the television networks; also testifying were the CEOs of major networks, including ABC, CBS, NBC, Fox, and CNN. The networks later carried snippets of the institute's findings on their evening news programs.

3-D Simulation Training

Some new RTI projects bordered on science fiction. For the U.S. Army Medical Research and Materiel Command, RTI developed a Virtual Emergency Medicine Simulator, a 3-D, virtual reality–based simulation program for the training of trauma care providers. Users of the system, first used by the Army in 2001, are presented with incidents such as gunshot wounds and vehicle collisions and are given access to a variety of tools to treat the virtual patients, from stethoscopes to splints. The interactions are recorded so they can be reviewed after the training session. The 3-D simulator was adapted to suit the needs of nonmilitary health care providers who want to sharpen their assessment and decision-making skills.

The institute's proprietary AVATALK is a similar technology: a virtual training program that makes it possible to have a natural, interactive conversation with a responsive virtual human. In

Voter News Service contracted with RTI to review its procedures and methodologies following the organization's advance miscall of the 2000 presidential election. In 2001, RTI statistician Paul Biemer, far right, above, testified before Congress about RTI's findings. RTI developed AVATALK, opposite, to train police officers how to interview and interact with mentally ill individuals in the field.


Just Talk
Interaction with a Paranoid Schizophrenic
Menu
Help
Exit
VTO
POLICE
Introduction
Guided Practice
Practice
Evaluation
Talk to VTO
End Interaction
Release
Detain
HARDWARE
GATEWAY2000
SHERIFF'S OFFICE

The U.S. Army contracted RTI to adapt simulation technology to train soldiers, below, in the maintenance and repair of military vehicles. The Maintenance Training System raised the Army's student-to-teacher ratio from two-to-one to eight-to-one. Fewer tactical vehicles were required for training, saving the army millions of dollars. For NASA, RTI developed a device to detect wind shear, once a cause of many airliner crashes; right, computers generate runway images in a simulator designed to help pilots prepare for encounters with wind shear. Opposite, Nicholas Oberlies hunts for cancer-fighting compounds in mushrooms.

a project for the National Institute of Justice, AVATALK was adapted to train police officers how to interview mentally ill individuals. The technology helps officers assess the mental state of a suspect and determine the proper course of action as well as the proper and legal interviewing techniques to be used.

Wind Shear and Vortex Turbulence

RTI was instrumental in contributing to a number of aviation- and space-related projects. RTI developed a device for NASA to help detect wind shear, a dangerous and hard-to-detect weather condition. Institute engineers worked with NASA to build an airborne simulation model of the Doppler radar system and then tested its feasibility in flight. The success of this experimental device led several private companies to manufacture wind shear detection systems. In 1996, the Federal Aviation Administration (FAA) required all airlines to have such devices on board at all times. Since then, there has not been a wind shear crash of any airliner so equipped.

RTI also worked with NASA to develop a system to detect wake vortex, turbulence that has caused numerous airliner crashes, and a system to give pilots a three-dimensional, simulated view of their surroundings in darkness or bad weather. In addition, RTI has studied safety concerns associated with commercial space travel for the FAA and, for NASA, has developed software to investigate the possible impact from a rocket that fails and falls to Earth.

Slow but Productive Work

Much of the research undertaken by the institute required persistence, such as continued work led by Ivy Carroll to develop compounds to treat cocaine addiction. With funding from the National Institute on Drug Abuse, Carroll and his colleagues developed a class of selective kappa opioid receptor antagonists. Animal studies at the University of North Carolina and other laboratories showed that the most interesting compound, named JDTic, offered significant potential as a treatment for cocaine relapse, depression, schizophrenia, anxiety, and other central nervous system disorders. Additional studies of its efficacy were undertaken, providing increasing evidence of a worthwhile treatment for both cocaine and heroin relapse. JDTic is in advanced preclinical development for treatment of cocaine relapse.

Meanwhile, the Natural Products Laboratory was in the thick of its longstanding research of natural compounds, such as mushrooms, offering anti-cancer activities. Funded by the American Cancer Society, researchers screened hundreds of mushroom specimens and found that roughly 3 percent had the ability to kill cancer cells. They're still at this work, further examining the active specimens while screening a repository of another 10,000 mushroom specimens in the quest for new chemotherapy agents.

The Aftermath of 9/11

The terrorist attacks in New York City and Washington, D.C., in 2001 and the subsequent military strikes against Afghanistan and Iraq had a profound impact on RTI's work—as well as on its growth. Just two months after the 9/11 tragedy, the institute was contracted with to conduct a

RTI Health Solutions is a business unit of RTI that provides consulting and research expertise to design risk-management programs, evaluate disease burden, assess safety, and measure value for pharmaceutical, biotechnology, and medical-device manufacturers. Its services, including safety and surveillance programs covering a wide range of drugs, are in demand following several recent drug-safety cases and greater regulatory calls for increased accountability by pharmaceutical companies.

RTI Health Solutions

After many years of service to global pharmaceutical, medical device, and biotechnology companies, RTI created a separate business unit, RTI Health Solutions, in 2000 to grow this research domain. Performing health economic, psychometric, epidemiologic, health outcomes, and other research, plus offering consulting, the new unit was successful soon after it was founded—attracting GlaxoSmithKline, Pfizer, Bristol-Myers Squibb, Novartis, and AstraZeneca as clients in its first year of operation.

RTI's Josephine Mauskopf, Ph.D., was in England at the time the unit was formed, having just opened RTI's first office in that country, in Manchester. When she returned, she was named the first executive director of RTI Health Solutions. Its original staff of 26 people was pulled from different parts of the institute, and the new Manchester office became RTI Health Solutions' European headquarters.

RTI Health Solutions now comprises a staff of more than 170 employees in the United States, Canada, and Europe. This broad group of experts in epidemiology, biostatistics, drug safety, pharmacovigilance, psychometrics, patient-reported outcomes, pricing/reimbursement, clinical development, and other fields assists companies by conducting a wide range of independent health economics and outcomes studies.

In 2004, for example, RTI Health Solutions was contracted to study the drug Tysabri, which the Food and Drug Administration had approved to treat multiple sclerosis. Although Tysabri demonstrated no serious side effects during clinical trials, once in the marketplace, it was associated with rare incidences of a brain infection that caused death or severe disability. The drug's joint manufacturers—Biogen Idex and Elan

Pharmaceuticals—quickly withdrew it from the market. Many patients had reported no side effects, however, and wanted Tysabri back on the market to alleviate their symptoms. "We were retained to determine if people with multiple sclerosis would be willing to absorb the risk of an adverse event of 1 in 100,000 to make the disease more manageable," says Allen Mangel, Ph.D., senior vice president of RTI Health Solutions.

RTI Health Solutions' report found that patients were willing to accept ten-year mortality risks of 3 to 4 percent, compared to actual risks of 0.7 percent for typical symptom improvements. The FDA allowed RTI Health Solutions' findings to be submitted to its advisory committee investigating re-approval—the first time quantitative evidence on patient risk-benefit preferences had been considered by an FDA advisory panel. In June 2006, Tysabri was reintroduced, complete with a detailed risk management program.

RTI Health Solutions also is working with several pharmaceutical companies on various AIDS-related issues. For example, it developed a product value assessment dossier summarizing the existing evidence demonstrating the value of a new drug for managing HIV and AIDS. For another company, it designed a model that estimates the long-term cost-effectiveness of different HIV drugs and treatments. Many clients rely on the organization's expertise and study results to guide clinical development of drugs, as well as regulatory strategies and post-FDA-approval marketing.

Headquartered in Research Triangle Park, RTI Health Solutions works on a global scale. A new office in Barcelona, Spain, recently opened, and the company recently acquired Ottawa, Canada–based Palmer d'Angelo Consulting, Inc., a major pricing and reimbursement consulting firm. Clients over the years have come to rely on RTI Health Solutions to better understand the market for a new drug, how to value a drug in monetary terms, and how to expedite FDA approval and ultimate market introduction. The organization also provides critical safety and efficacy data and methods to maximize the product life cycle.

RTI conducted numerous studies in the wake of the terrorist attacks of September 11, 2001, including evaluating the level of post-traumatic stress disorder in New York City and creating a registry of people exposed to smoke, dust, and debris following the World Trade Center collapse. RTI has conducted research and testing in human exposure to contaminants for more than 30 years, leveraging state-of-the-art analytical tools. RTI's extensive test facilities include wind tunnels, test ducts, cleanrooms, and a suite of aerosol measurement and generation instruments. Opposite, the wind tunnel testing area.

survey assembling empirical data to inform public health policy. Sponsored by RTI and the American Legacy Foundation, researchers measured the level of post-traumatic stress disorder in New York City, Washington, and the rest of the country. The findings indicated that more than a half million people in New York had symptoms of PTSD and were 2.9 times more likely than those in other areas to have the disorder.

In another project, RTI collaborated with the New York City Department of Health and Mental Hygiene and the Agency for Toxic Substances and Disease Registry (part of the U.S. Department of Health and Human Services) to create a registry of people exposed to smoke, dust, and debris in the collapse and clean-up of the World Trade Center's twin towers. Funded by the Federal Emergency Management Agency, the project had as goals to identify and register people exposed to toxic substances; assess the occurrence of physical injuries and mental health effects among survivors; follow registrants over time; identify people for future scientific studies; plan and target public information and health education; and inform public policy related to the World Trade Center disaster and future environmental disasters.

More than 71,000 people were interviewed. They included rescue, recovery, and cleanup workers; residents; students and staff at schools and daycare facilities; and employees in the damaged or destroyed buildings. RTI's roles in the project included developing a database of potential registrants and assigning registrants to groups based on their likely level of exposure; helping to conduct a public outreach and media campaign; developing a Web-based questionnaire for use in telephone and in-person surveys; conducting interviews in English, Spanish, Cantonese, and Mandarin; designing and testing the computer system; and developing and deploying a system and procedures for managing, processing, and delivering the data to the New York City health department.

"The registry will help researchers understand the long-term physical and mental health effects of the disaster on the people most acutely exposed," says Paul Pulliam, RTI's associate project director for the registry. Lisa Thalji was the project director.

The Centers for Disease Control and Prevention (CDC) funded a post-9/11 project to evaluate the capability and capacity of state public health laboratories to respond to chemical terrorism. RTI conducted a literature review and

RTI works with manufacturers and users of air filters to evaluate the efficiency of air-cleaning equipment in removing particulate, gas, and bioaerosol contaminants, the latter the focus of researcher Karin Foarde. Here, Foarde holds a bioaerosol sampler, an instrument used for collecting viable bacteria and fungi from the air.

designed and administered a five-state Web survey. Then RTI coordinated a nationwide consensus-building workshop that brought together representatives of the public health laboratories, the Environmental Protection Agency, the Department of Defense, and the Federal Bureau of Investigation to develop policy recommendations for strengthening the laboratories' ability to respond to chemical attacks.

RTI also examined the public health response to the anthrax attacks of late 2001 for CDC. Researchers interviewed more than 6,000 postal, government, and media workers in New York, Connecticut, Florida, New Jersey, and Washington, D.C., who were potentially exposed to anthrax, an acute infectious bacterial disease that can be deployed as a biological warfare agent. "Many were receiving these treatments like antibiotics regimes, and we wanted to get a sense if they had adverse health outcomes," says James Hersey, Ph.D., director of the institute's health psychology program. The study affirmed that most of the antibiotic regimes were, in fact, successful treatments.

In a related project, microbiologist Karin Foarde studied products that filtered ventilated air for biological and chemical substances, thereby providing early detection of warfare agents. Across RTI's campus, other researchers adapted the institute's virtual reality simulation technology to instruct health care personnel on how to respond to biological and chemical agent events.

RTI Helps Iraq Establish Local Governance

In 2002, Research Triangle Institute was tradenamed RTI International, recognizing its widening global footprint and sharpened focus on improving the human condition globally. The following year, after Ron Johnson—as part of Haynes' strategic planning process—had drafted a business plan for an expanded approach to international development research, RTI International began one of its most demanding projects ever: the USAID-funded Local Governance Program to help establish democratically elected local governments following the overthrow of Saddam Hussein in Iraq.

Under Iraq's previous, highly centralized regime, citizens had almost no experience with local governance or active participation in the governing process. To inform and train Iraqis in local governance systems, RTI ultimately set up offices in Iraq's eighteen provinces. A staff of 200 people drawn from 33 countries, augmented by the hiring of 800 Iraqis, was deployed. In succeeding months, these numbers grew. "It was extraordinary; no one has ever seen a reconstruction program of this magnitude since the Mar-

shall Plan," recalls Aaron Williams, vice president of international business development and its liaison with USAID. "I was part of the five-man startup team to go to Iraq in April 2003. We set up offices in the provinces and over the course of the year had a staff of about 2,500 people working for us."

Their first task was to provide technical assistance and training to local administrators—locally based representatives of central government ministries—to help them improve their management skills and understanding of municipal services. As USAID outlined in a field manual, the empowerment of local government institutions "is designed to improve the delivery of public services to the Iraqi people and make the Iraqi government more responsive to their needs."

RTI worked with councils, governors, mayors, and other political institutions in the country's eighteen provinces and helped technical departments improve the delivery of public services. RTI set up information and communication technology and trained local elected officials and governmental agencies in a wide range of disciplines, among them democratic structures; accounting, resource allocation, and budget planning and implementation; and the empowerment of women. RTI also has helped restore essential services such as water, power, sewerage, health care, and education.

The complications and complexity were unprecedented. "Logistically, it was one of the most challenging things we've done," says Gordon Cressman, senior director of information and communications technology. The resilient insurgency in various regions of the country created dangerous conditions for staffers and for Iraqis to establish a democratic society.

Two things were key to the project's success: first, despite the dangers, local Iraqi elected officials persevered; second, RTI convinced provincial council members to meet together across provinces so they could develop their own solutions to vexing problems facing them all. "It took us almost two years to persuade them that they should meet," says Ron Johnson, currently a senior policy advisor for international development. "There was a lot of suspicion, with each province initially maintaining that they would

Representatives from across Iraq gather in Baghdad to identify ways to improve coordination between provincial planning and a national development strategy. RTI's participation in the U.S. Agency for International Development's Local Governance Program set the stage for the convention, hosted by the country's Ministry of Planning and Development. Ronald Johnson, left, senior policy advisor for international development and an internationally recognized expert on governance strategies to stabilize post-conflict situations, has played a key role in RTI's work with USAID to help establish effective democratic governance at the local level in Iraq.

The Iraq project brought to RTI new people, processes, and a dramatic increase in revenues; it also solidified the role of USAID as its major client. While the project continues, RTI has intensified its mission to improve the human condition around the world, leveraging its scientific resources to deliver a wide range of health, education, and local governance-strengthening programs in developing nations.

only meet with neighboring provinces. Finally, we convinced them to participate in a national meeting in February 2006."

That meeting went well. Representatives of the provincial councils agreed to draft legislation to submit to the national Council of Representatives, amplifying in detail the basic constitutional provisions that would pertain to local government. Then, in a single meeting in August 2006, the representatives created the Local Government Association and ratified a draft of a local government code.

The ability of provincial governments to make progress led to another significant achievement for local Iraqi governments: the preparation

At present, approximately 90 RTI staff members and 600 Iraqi staff members are in Iraq providing technical support, assistance, and training to local Iraqi government officials. They're also working alongside U.S. military and other officials to help implement reconstruction and community development efforts—ever cognizant of the human toll. Recently, the institute's staff in Baghdad helped transport and house three severely disfigured Iraqi children and their families from Iraq's Al Anbar province to receive restorative surgery outside the country.

While the Iraq project was the latest in a long history of helping developing countries improve their local governance, it also marked an important juncture for the institute. The Iraq project brought to RTI new people, processes, and a dramatic increase in revenues; it also solidified the role of USAID as RTI's major client. While the project continues, RTI has intensified its mission to improve the human condition around the world, leveraging its scientific resources to deliver a wide range of health, education, and local governance-strengthening programs in developing nations. A significant portion of the institute's growth in the five years leading up to its 50th anniversary was fueled by its international development programs, which are having tremendous impact around the world.

On the heels of the early success in Iraq, Victoria Haynes and RTI's leadership team took a strategic look at RTI's social sciences and statistical organization that provided assistance to developing nations. RTI organized an operating unit called the International Development Group (IDG). Johnson was named executive vice president in charge of the unit.

IDG assembled a staff of more than 200 international researchers and a large field organization. Rapid growth in international development work followed. The new emphasis on international research marked the third major transformation of RTI in its 50-year history—the

of a five-year economic and social development strategy in each province. In March 2008, more than 220 representatives from across Iraq met in Baghdad for the country's first provincial development strategy convention—coming together even in a fractured and volatile national political environment to identify ways to better coordinate provincial planning with Iraq's national development strategy.

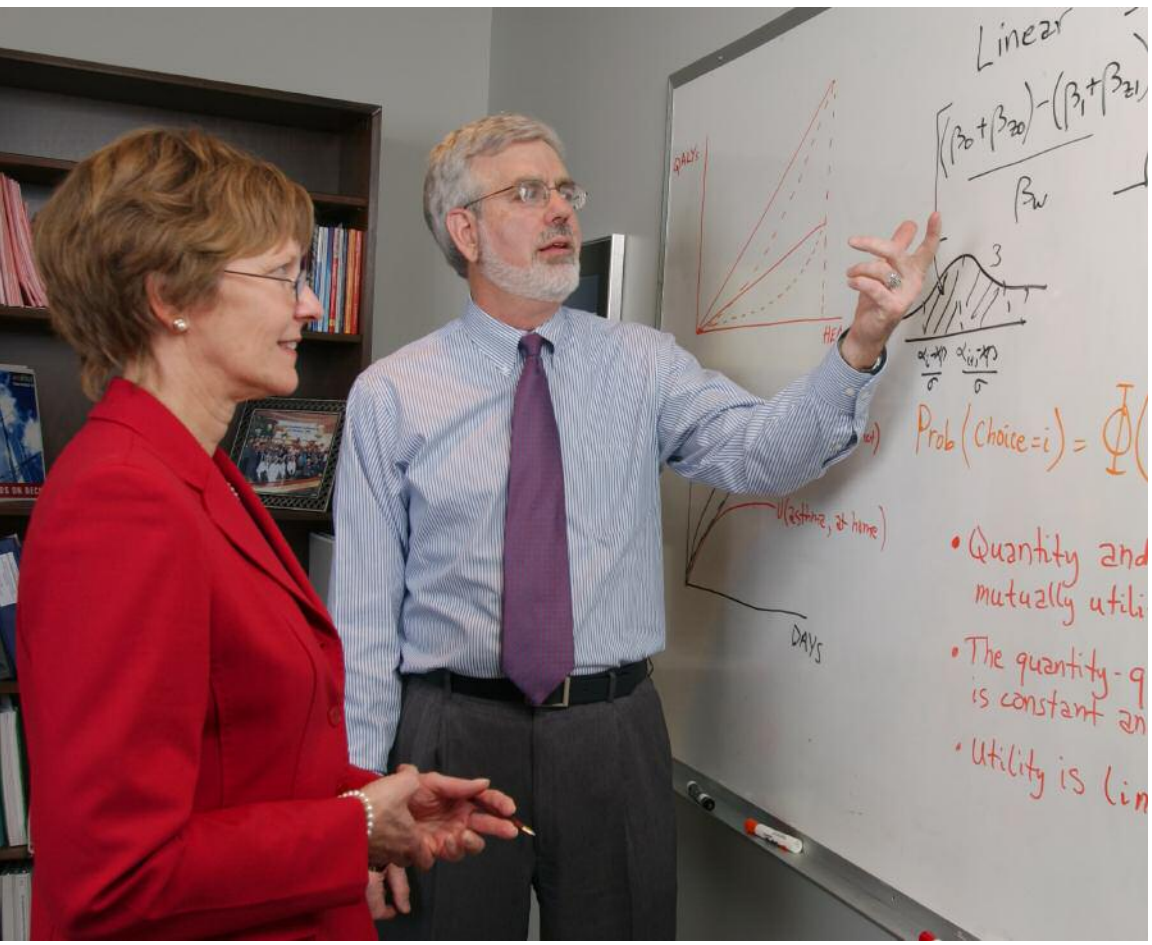
Tony G. Waldrop, Ph.D., a member of RTI's board of governors and vice chancellor for research and graduate studies at UNC, says, "Years from now, I hope people will point to this work as the foundation for democracy in this vital region of the world."

RTI International's Local Governance Project in Iraq has supported efforts to strengthen local, municipal, and provincial government, under contract with USAID. The aim of the project is to help Iraqis establish local governments that are transparent, accountable, and responsive to constituents. Left, an Iraqi woman casts a vote in the country's first postwar election; opposite, sheiks from south-central Iraq gather in Hillah for an RTI presentation on democratization in 2004.

first having occurred with a move into the social sciences in the 1960s and the second with a shift into technology and health care in the 1980s. As of 2008, RTI's international staff is involved in more than 40 projects in more than 40 countries, serving its clients through offices strategically located around the world.

Strategic Planning Paves the Way

Haynes' primary strategic priority leading RTI was to build upon its already formidable scientific stature and singular multidisciplinary approach to research. In this quest, she would guide the development of a number of new initiatives, such as the institute's Fellow Program. Haynes conceived of the program as a way to provide professional opportunities for exceptionally talented research staff committed to RTI's mission. Today, more than 20 Fellows serve as leaders to influence RTI International's scientific direction and business strategies. "Fellows represent the institute in their respective fields and within the scientific community, but they also reach out and cross over into other disciplines through collaboration with other parts of the organization," says Edo Pellizzari, a Lead Fellow for the Fellow Program. "We're charged to help RTI maintain strong research and science programs and to foster cross-disciplinary interactions. A major role of a Fellow is mentoring young, next-generation scientists by passing along knowledge and lessons learned in their fields. Fellows are the resident gurus of science at RTI."



Fellows also advise executive management and the board on the state of science in their areas of expertise and serve as mentoring role models for the institute's younger scientists. Other new initiatives to build scientific stature include a Visiting Fellow Program—staffers who serve as senior advocates in Washington, D.C., promoting the institute's research capabilities and providing policy expertise—and a Professional Development Program providing sabbatical leaves to staff.

Boosting Internal Efficiency and Control

The sheer size and diversity of the staff—approximately 2,000 by 2002—made gathering people for projects a challenge. "In the old days, you went to the cafeteria, sat down, and had informal meetings where you got to know your colleagues, their disciplines and work," says Pellizzari. "As more people joined the organization from more disciplines, it became harder to know who was doing what."

It became clear that RTI needed to be more systematic in the way it fostered collaboration, so the institute launched a variety of initiatives to facilitate cross-organizational communication and work. The RTI Fellows conducted a symposium in which researchers presented the spectrum of institute programs and activities. Meanwhile, RTI deployed the latest technology

for videoconferencing, computer networking, and intranets to link people across multiple locations in the United States and around the world.

RTI also set out to become more efficient and effective in its administrative functions—centralizing some activities, such as proposal development, but doing so in ways designed to preserve the institute's entrepreneurial spirit. New project management and training programs were implemented, as were processes for sharing best practices organization-wide.

In the aftermath of the Enron scandal and the enactment of the Sarbanes-Oxley Act, the institute established a program called BASIC to strengthen and monitor its internal controls and financial reporting (even though as a nonprofit organization it is not required to comply with the new law). Other internal changes included the restructuring of the legal organization to assist scientists in acquiring patents for their technological innovations, the creation of an Author's Awards program to encourage and recognize individual scientists' published research, and the launching of RTI Press as the institute's venue for publishing researchers' work.

As RTI continued to review its resources with a more strategic mindset and an eye toward improving certain capabilities, the institute in 2002 made its first acquisition: Boston-based Health Economics Research (HER), a leading contractor for the Centers for Medicare and Medicaid Services (CMS). HER had competed against RTI for contracts from CMS and was well-known by the institute's staff. The acquisition strengthened RTI's capabilities in health and social economic research and made RTI a dominant player in the competitive CMS research arena. HER had been founded by husband-and-wife team Janet Mitchell, Ph.D., and Jerry Cromwell, Ph.D. Both stayed with RTI after the acquisition.

RTI launched a Fellow Program in 2001 to provide researchers with a professionally satisfying alternative to a career in scientific management. Fellows perform a variety of senior-level duties, including serving on a Scientific Advisory Committee that advises RTI's president on technology. Opposite, Fellow F. Reed Johnson consults with RTI Health Solutions colleague Elizabeth B. Andrews, vice president, pharmacoepidemiology and risk management. Above, left to right, RTI's Brian Burke, Craig Hill, and John Hollywood enjoy a walk through the bucolic environment of RTI's campus, part of RTI's appeal as a great place to work.

Stamping Out Teen Smoking

The Centers for Disease Control and Prevention continued to rely on RTI, retaining it in 2002 to measure the effectiveness of the American Legacy Foundation's "truth" youth smoking-prevention campaign. The foundation, formed as a result of the settlement of a major lawsuit between states and the tobacco industry, was given a mandate to reduce smoking, particularly among youth, in the United States. The foundation's $100 million mass media campaign detailing the adverse health effects of smoking was invested primarily in television, radio, and Internet advertising. The question before CDC was whether or not the campaign was effective.

Matthew Farrelly, Ph.D., and his colleagues scrutinized the campaign to discern its value in

RTI researchers are applying their expertise in economic analysis, program evaluation, and survey research to help policymakers devise a solution to the epidemic of obesity in America. RTI's research indicates that obesity costs the nation as much as $93 billion each year.

reducing tobacco use among young people. They initially undertook surveys of teenagers in 210 media markets across the country to determine if they had seen the foundation's antismoking advertisements—75 percent, in fact, had. Subsequent surveys indicated that the campaign was achieving the desired effect.

"By 2002, the second year of the campaign, smoking rates overall were 1.5 percentage points lower than they would have been in the absence of the campaign, which translates to roughly 300,000 fewer youth smokers in the United States," says Farrelly. "That's a 22 percent total decline in youth smoking. We confirmed the result by accounting for other influences." The findings were published in the *American Journal of Public Health.*

Farrelly's team undertook similar studies of anti-tobacco campaigns at the state level. New York State, for example, had committed more than $250 million from 2000 to 2006 in its tobacco-control campaign. Studying its effectiveness, the institute reported that the prevalence of youth and adult smoking had declined faster in New York than in the U.S. as a whole—a reduction of more than 600,000 smokers in the state over the six-year duration of the campaign.

CDC also funded a 2003 RTI study of the medical costs of obesity. The findings indicated that medical spending related to obesity accounted for 9.1 percent of the nation's total health care costs—as much as $93 billion a year—roughly half of it financed by taxpayers through Medicare and Medicaid expenditures. Subsequent institute studies indicated that obesity costs companies as much as $2,500 per employee in medical expenses and absenteeism every year.

New Research to Clear the Air

As Beijing prepared for the 2008 Olympics, the capital city of China realized it needed to reduce the hazardous air pollution caused by its rapid industrial growth and the airborne residue of periodic dust storms. Beijing's municipal government turned to RTI to create an air-pollutant emissions inventory that would identify contributing sources such as factories, power plants, cars, and small businesses. "We're taking inputs of pollutant types from different facilities and are using modeling tools to predict what the air quality will be like, if, for example, a facility shut down for 24 hours," says Becky Nicholson, RTI's director of environment, health, and safety. "The information will assist Chinese officials in decision making."

RTI International bolstered its environmental services work in emission standards following the acquisition of Midwest Research Institute's Cary, North Carolina–based operations in 2002. The acquisition added approximately 20 environmental engineers to the institute's staff and expanded RTI's capabilities in the regulatory development area to include engineering expertise in more than 60 industries, including petroleum refineries, electric utilities, and metals and minerals processing. As of 2008, RTI's industrial-sector knowledge was being applied to study greenhouse gas emissions and their contribution to climate change.

Gold in the Brownfield?

RTI's environmental research in the 2000s addressed ground as well as air pollution and fostered the development of a unique enterprise to help clients evaluate the commercial potential of "brownfield" sites. Many companies own hun-

RTI developed a decision-support system to help officials in Beijing, China, improve air quality in time for the 2008 Olympics in Beijing, whose central city can be seen, above, through a hazy sky. In an effort aimed at a clean and efficient process for extracting gas from coal, RTI is working with industrial partners to develop a reactive granular bed material that would act as a filtration medium and remove contaminants like hydrogen sulfide and hydrochloric acid from hot-synthesis gas—increasing the amount of electricity that can be produced with the same amount of coal. The tower at left has been used to measure the mechanical strength of reactive granular bed filter media.

Adding to the World's Knowledge

Throughout RTI's history, institute researchers have published their findings in many leading peer-reviewed journals, books, and magazines, contributing to the world's knowledge as well as to the institute's stature and reputation for scientific integrity. Here are some recent examples:

Beard, S.M., Wall, L., Gaffney, L., and Sampson, F. (2004). **Aggressive non-Hodgkin's lymphoma: economics of high-dose therapy,** *Pharmacoeconomics,* 22 (4):207-224.

Oberlies, N.H., and Kroll, D.J. (2004). **Camptothecin and taxol: historic achievements in natural products research,** *Journal of Natural Products,* 67 (2):129-135.

Das, A., Poole, W.K., and Bada, H.S. (2004). **A repeated measures approach for simultaneous modeling of multiple neurobehavioral outcomes in newborns exposed to cocaine in utero,** *American Journal of Epidemiology*, 159 (9):891-899.

Finkelstein, E.A., Fiebelkorn, I.C., Corso, P.S., and Binder, S.C. (2004). **Medical expenditures attributable to injuries-United States, 2000,** (Reprinted from *MMWR*, vol 53, pg 1-4, 2004), *JAMA*, 291 (7):817-818.

Wechsberg, W.M., Lam, W.K.K., Zule, W.A., and Bobashev, G. (2004). **Efficacy of a woman-focused intervention to reduce HIV risk and increase self-sufficiency among African American crack abusers,** *American Journal of Public Health*, 94 (7):1165-1173.

Cromwell, J., Maier, J., Gage, B., Drozd, E., Osber, D., Richter, E., Greenwald, L., et al. (2004). **Characteristics of high staff intensive Medicare psychiatric inpatients,** *Health Care Financing Review,* 26 (1):103-117.

Holmberg, S.D., Moorman, A.C., and Greenberg, A.E. (2004). **Trends in rates of myocardial infarction among patients with HIV,** *New England Journal of Medicine,* 350 (7):730-732.

Johnson, E.O., Roth, T., Schultz, L., and Breslau, N. (2006). **Epidemiology of DSM-IV insomnia in adolescence: lifetime prevalence, chronicity, and an emergent gender difference,** *Pediatrics,* 117 (2):e247-e256.

Lin, H.Q., Van Wagner, E., Freeman, B.D., Toy, L.G., and Gupta, R.P. (2006). **Plasticization-enhanced hydrogen purification using polymeric membranes,** *Science*, 311 (5761):639-642.

Rein, D.B., Fiore, A.E., and Bell, B.P. (2006). **What's next for the hepatitis A vaccine?** *Lancet,* 367 (9510):546-548.

Ferguson, N.M., Cummings, D.A., Fraser, C., Cajka, J.C., Cooley, P.C., et al. (2006). **Strategies for mitigating an influenza pandemic,** *Nature*, 442 (7101):448-452.

Gibbs, D.A., Martin, S.L., Kupper, L.L., and Johnson, R.E. (2007). **Child maltreatment in enlisted soldiers' families during combat-related deployments,** *JAMA*, 298 (5):528-535.

Bailey, R.C., Moses, S., Parker, C.B., Agot, K., Maclean, I., et al. (2007). **Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial,** *Lancet,* 369 (9562):643-656.

Carroll, F.I., Kotturi, S.V., Navarro, H.A., Mascarella, S.W., Gilmour, B.P., et al. (2007). **Synthesis and pharmacological evaluation of phenylethynyl[1,2,4]methyltriazines as analogues of 3-methyl-6-(phenylethynyl)pyridine,** *Journal of Medicinal Chemistry,* 50 (14):3388-3391.

Bailey, D.B., Skinner, D., Davis, A.M., Whitmarsh, I., and Powell, C. (2008). **Ethical, legal, and social concerns about expanded newborn screening: fragile X syndrome as a prototype for emerging issues,** *Pediatrics,* 121 (3):e693-e704.

Adams, M.M., and Barfield, W.D. (2008). **The future of very preterm infants: learning from the past,** *JAMA*, 299 (12):1477-1478.

Tyl, R.W., Myers, C.B., Marr, M.C., Sloan, C.S., Castillo, N.P., Veselica, M.M., et al. (May 6, 2008). **Two-generation reproductive toxicity study of dietary bisphenol A (BPA) in CD-1 (Swiss) mice,** *Toxicological Sciences*, 104 (2): 362-384.

Ringeisen, H., Casanueva, C., Urato, M., and Cross, T. (2008). **Special health care needs among children in the child welfare system,** *Pediatrics,* 122 (1):e232-e241.

dreds if not thousands of these properties contaminated by hazardous substances, and they must value the parcels as environmental liabilities on their balance sheets. Deciding which sites to clean up and redevelop, hold onto for some long-term use, or simply divest is a complex undertaking. "Companies are literally besieged with reams of data," explains Glenn Osmond, senior director of Sustainable Business Solutions (SBS), a partnership between RTI and Marsh Inc., a global insurance broker that is a unit of Marsh & McLennan Companies.

The institute previously had developed a software application for a private client that effectively evaluated the client's contaminated properties to understand the risk-reward trade-off for divesting or maintaining the sites. Having been involved in this research, Osmond brought it to Haynes for consideration as a commercial entity. With close to 50 percent of the more than $1 trillion in commercial properties held by U.S. corporations considered impaired, according to the National Brownfield Association, the opportunities were clear.

Two More Spinoffs and an Acquisition

Between 2005 and 2008, RTI announced another acquisition and two spinoffs. The first of the spinoffs involved the commercialization of a revolutionary thermoelectric material developed by Rama Venkatasubramanian and his colleagues. The spun-off enterprise—Nextreme Thermal Solutions—manufactures thermoelectric devices addressing the thermal management needs of the electronics, photonics, biomedical, and aerospace industries.

A few months later, RTI acquired three divisions of the MCNC Research and Development Institute. RTI and its founding universities had formed MCNC (Microelectronics Center of North Carolina) in 1981. Researchers and research contracts from the three divisions—signal electronics, materials and electronic technologies, and advanced network research—became part of the institute's science and engineering group. The acquisition complemented RTI's strengths in microfabrication, signal electronics, and network systems and security. "The divisions had expertise in areas where we did not have a high degree of research focus, such as sensors for defense and homeland security applications," says Sam Field, vice president of RTI's Digital Solutions, which absorbed two of the units.

In 2008, another innovative computer technology developed in RTI's laboratories made its way closer to commercialization with the establishment of siXis, Inc. Financed in part by RTI, siXis will market a technology that promises to increase computer performance while reducing the size of integrated circuits and power requirements. The technology allows bare die integrated circuits to be densely populated onto a large area silicon substrate, replacing the current method of putting packaged die onto a conventional circuit board—making it possible for a smaller overall system to deliver higher performance. SiXis will first apply its technology to the reconfigurable computing market, which demands high performance, low power, and small size.

After the Hurricane, Before the Pandemic

As RTI neared the half-century mark, the forces of Mother Nature tested the institute's mettle along with that of the nation. RTI was called upon to confront the aftermath of Hurricane Katrina, the most costly and one of the five

Since Hurricane Katrina struck the Gulf Coast in 2005, RTI has contributed to relief and recovery efforts on several fronts and has worked to ensure that such activities proceed more smoothly in future disasters. RTI's work has included developing a set of databases from which maps and reports on relief efforts were generated, assessing water and air quality in affected areas, designing a system to track patients evacuated during disasters of many types, and conducting surveys to understand the mental health and substance-abuse problems of displaced victims.

Veronica Nonhlanhla Mnisi, Field Supervisor Winnie Gumula, and Mmapaseka Mogale, left to right, work for Sizanang Centre for Research and Development, a nonprofit company that RTI created in 2002 to further its mission in South Africa. Sizanang's focus is on health, HIV/AIDS education, poverty, democracy, and governance. Right, RTI's woman-focused drug-abuse prevention program developed in Durham, North Carolina, was so successful that it was exported to South Africa. K. K. Lam was principal investigator for the Durham project, which used dialogue between African-American mothers who used crack and their preadolescent children to prevent substance abuse among youth and lower risks of HIV infection.

A Global Presence in HIV/AIDS

Shortly after the worldwide AIDS pandemic exploded in the 1980s, RTI was charged with conducting far-reaching studies of the disease and its underlying cause, human immunodeficiency virus, or HIV. HIV/AIDS research has been an important part of the institute's health care agenda ever since.

The institute's HIV/AIDS research is broadly based—not surprising given the multidisciplinary expertise of RTI researchers. In 1985, for example, RTI's Philip Cooley researched heroin usage rates for the National Institute on Drug Abuse. He found that recreational use of the drug was on the rise, prompting policymaking discussion and decisions. Several years later, Cooley worked with the Centers for Disease Control and Prevention to develop a transmission model for HIV, examining how the virus spreads through populations. "We tried to replicate the epidemic, working backwards to reconstruct when people got infected," Cooley explains. "The existing methodology was flawed, and we were able to demonstrate a better approach." This modeling work continues today.

RTI also served as the clinical coordinating center for a study of the pulmonary complications of AIDS, funded by the National Institute of Allergy and Infectious Diseases and the National Heart, Lung, and Blood Institute, and it provided support services to the National Cancer Institute's epidemiological studies of retroviruses like HIV in high-risk populations. The objective of the latter study was to determine the link between intravenous drug use and AIDS, as well as effective treatments. Another important study included a cost-benefit analysis of AZT, the first anti-AIDS drug approved by the Food and Drug Administration.

In succeeding years, this wide range of research proliferated, garnering accolades and media attention for RTI. In 1996, in collaboration with Duke University and UNC-Chapel Hill, the institute researched an anti-HIV spermicide. Later, a study that found circumcision of adult men significantly reduced their risk of acquiring HIV through sexual intercourse was selected by *Time* magazine as the number-one medical breakthrough of 2007. RTI had served as the data coordinating center for a randomized trial in Kenya that demonstrated that circumcision of adult men significantly reduced their risk of acquiring HIV through heterosexual intercourse.

Another project mixed research with an effort to reduce the prevalence of AIDS in two North Carolina counties, Durham and Wake. Funded by the National Institute on Drug Abuse, Wendee Wechsberg, Ph.D., and other RTI researchers opened a "storefront" in the basement of an African-American church in Durham in 1998 to provide counseling about risky behavior. Work-

ing out of a small office in Raleigh, researchers traveled in a mobile van to areas frequented by drug users to collect information and provide similar counseling. Research from the project, called the North Carolina Cooperative Agreement for Community-Based AIDS Outreach, Intervention, and Research (NC CoOp), supplemented 22 other NIDA projects nationwide aimed at preventing AIDS.

The research findings indicated that women in the United States, particularly African-Americans, were disempowered and at great risk of contracting HIV. The NC CoOp has led to several offshoots. Most recently, in a five-year contract funded by the U.S. National Institute on Child Health and Human Development, Wechsberg and her RTI colleagues began working in 2008 with the Medical Research Council of South Africa. They are testing the effectiveness of combining voluntary counseling and HIV/AIDS testing with women-focused behavioral interventions to prevent the spread of the disease in that country.

Wechsberg's study involved 93 black South African women from Pretoria who were sex workers and routinely used cocaine. After completing a baseline questionnaire, the women attended two intervention sessions to learn strategies for preventing HIV, such as use of a female condom and assertive communication with a partner. The interventions also emphasized personal goal development, independence, and empowerment. Wechsberg ultimately determined that the program encouraged safer behaviors, including more frequent use of female condoms, reduction in daily use of alcohol and crack cocaine, and decreased use of alcohol when seeing clients. Additional projects followed, including the establishment of women's health cooperatives in Pretoria and Cape Town modeled on the NC CoOp.

RTI was involved in other AIDS-related projects in the 2000s. For example, the National Institute of Mental Health funded a study in which RTI coordinated the collection of HIV data from China, India, Uganda, Peru, Russia, and Zimbabwe. In this work, researchers used computer-assisted interviewing techniques to conduct interviews in eight languages. The institute also helped health care institutions in many developing nations, including Nigeria, track the causes and transmission patterns of AIDS.

Work under way by RTI in Uganda, above, is expanding access to HIV counseling, testing, and basic care services so community organizations and families can implement AIDS prevention programs.

deadliest hurricanes in U.S. history, and the threat of a potential worldwide flu pandemic.

Researchers' efforts in the first challenge culminated in a set of databases used to generate tailored maps and reports on Katrina relief efforts. In a parallel initiative, RTI helped develop a Critical Infrastructure Data System that maps all hospitals, community health centers, mental health and substance abuse treatment facilities, and federal medical shelters. EPA funded projects assessing environmental conditions in the devastated region, including the processing of water-quality data collected in the field by EPA scientists. Institute researchers also monitored airborne particulates in Louisiana and Mississippi, the two states most affected by Katrina.

In an attempt to detect hazardous components, RTI analyzed airborne materials collected near sites where damaged buildings were being demolished and where debris was being burned or ground into smaller pieces. RTI's data made it possible for the emergency response team to assess air quality and to ensure that emissions were within allowable ranges during cleanup activities.

When concerns over an avian flu pandemic swept the planet, researchers Phil Cooley and Jamie Cajka published a paper in *Nature* on the best response strategies, including school closures, antiviral treatments, and household isolation. The institute also collaborated with other organizations to develop a simulation model to predict how various interventions would affect the spread of flu in the United States and Great Britain—if a pandemic occurred. The study is one of several funded by the National Institute of General Medical Sciences' MIDAS project, on which RTI researchers and other scientists are collaborating to improve infectious disease models by leveraging new computer modeling techniques. MIDAS, an acronym for Models of Infectious Disease Agent Study, provides policymakers and public health officials with modern analytical tools to combat infectious diseases. RTI is MIDAS' core informatics group.

Another area of health research was undertaken by RTI's Chicago office for the U.S. Department of Health and Human Services. RTI developed solutions to overcome the wide variances in laws and business practices preventing nationwide sharing of electronic health information. The project responded to a presidential mandate that all Americans have electronic health records by 2014 as a way to generate improved treatment outcomes.

Meanwhile, researchers in RTI's Rockville, Maryland, offices and scientists in laboratories at Research Triangle Park collaborated to determine the extent to which genetics affect a person's immune response to cholera and typhoid vaccines. Diane Wagener, Ph.D., leads the project—one of six that make up the National Institute of Allergy and Infectious Diseases' new Population Genetics Analysis Program, a national research effort to improve defenses against bioterrorism and infectious diseases. During the five-year study launched in 2004, researchers will immunize 2,000 residents of India's Hindi and Muslim ethnic groups and their family members against cholera or typhoid. They will then attempt to correlate potential relationships between the subjects' genetic makeup and their response to the vaccines.

Battling Diseases Worldwide

For several decades, RTI has worked to prevent and control a wide range of diseases in Africa and Asia. To combat malaria, a parasitic disease transmitted by *Anopheles* mosquitoes, RTI is taking a coordinated attack against the mosquito population, employing vector control interventions like insecticide-treated nets and indoor residual spraying. By treating more than 683,000 homes, RTI is helping to protect more than 2.5 million people from one of the world's most fearsome diseases. The project supports the U.S. government's Malaria Initiative, which seeks by 2010 to reduce by 50 percent the number of deaths caused by malaria in sub-Saharan Africa.

Besides the malaria interventions, the staff is tackling such lesser-known tropical diseases as schistosomiasis, onchocerciasis (river blindness), intestinal worms, lymphatic filariasis (elephantiasis), and trachoma—diseases that affect half the world's population, especially the poorest of the poor and children. "These are terrible diseases that are largely unknown in the developing world, and yet they affect at least one billion people in developing nations, causing painful and often disfiguring disabilities," says Haynes. "They are also completely treatable with relatively low-cost medicines."

Fifty Years of Success Improving the Human Condition

As RTI looked toward its 50th anniversary, it did so with pride in past accomplishments and eagerness to meet the scientific and societal challenges and opportunities ahead. In an ever-changing world, the need for independent, objective research and science-based solutions is stronger than ever.

Haynes and her team have changed RTI to more effectively respond to the exigencies of an increasingly interconnected world. Today, the institute is truly global in nature and reach; its long-desired goal of increasing private-sector business has been effectively realized, with commercial contract revenues three times greater than in 1999; and its core mission to improve the human condition is clearer than ever. RTI also has developed a more businesslike way of operating, yet it still hews closely to its origins as an interdisciplinary research institute offering solutions to the difficult problems confronting humankind.

Inspired by this mission of improving the human condition, institute researchers still develop projects largely on their own, a

Trainees in Angola, above, use water to practice techniques for indoor spraying. In 2006, RTI helped treat the homes of 760,000 Angolans to repel or kill mosquitoes carrying malaria and other diseases. In the United States, opposite, researchers at RTI host an exercise to test the responses of public health agencies to an outbreak of avian flu in a simulated community of 500,000 residents.

What began largely as an effort to plug a brain drain in the Piedmont became a magnet for the best and brightest scientists the world over, united for more than 50 years in a common mission to improve the human condition.

bottom-up approach that has proved its merit for five decades. Although scientists over the years have left the institute for jobs in the private sector, many returned, drawn back by the opportunity to solve scientific challenges that intrigue and compel them and to serve a higher purpose. "This is a great place to work—the best, really," Haynes says. "What makes us unique is our mission, which has helped us attract not only superb scientists but passionate ones."

What's next for RTI? "To prepare for the future, the institute is investing in new technolo-

gies, new capabilities, new business processes, and modernized facilities," says Haynes. "Our goal is to maintain and grow our existing business and also pursue new and emerging research fields." These include global health, sustainable economic and social development, and integrated health research and laboratory services. "These are areas in which we can succeed and make a positive difference around the world," Haynes says.

With this in mind, RTI made several strategic investments in the months leading to its 50th anniversary. In partnership with its founding universities, RTI established the Research Triangle Energy Consortium to increase the four organizations' collective capacity to address the scientific and policy research needs affecting global energy, the environment, and climate change. This pivotal collaboration has already spawned a project to develop biofuels from non-food organic materials. At the same time, RTI has enhanced its commitment to global health, hiring six prominent HIV/AIDS researchers from the University of California, San Francisco, to help pursue new projects for its global health agenda. The institute also has strengthened its existing drug development capabilities and biomarker research, retaining a chief medical officer to increase its ability to conduct clinical research. It has further broadened its expertise in sustainable economic and social development by exploring new operating models and structures to strengthen and connect its multidisciplinary capabilities and thus enhance its position in this emerging market. Says Haynes, "The talent that resides here and in our founding universities makes it all possible."

Thousands of brilliant and devoted people have made the trek to North Carolina's Research Triangle Park, where, working for RTI, they have invested their scientific expertise in collaboration with others to improve the human condition. Many have been dispatched to the far corners of the globe on behalf of this mission, while others are engaged in research from their homes as telecommuters serving a similar quest. Maybe it is ironic—or perhaps it is RTI's pinnacle achievement—that what began a half century ago as a way to plug a brain drain in the Piedmont is now a magnet for the best and brightest scientists the world over.

Multidisciplinary research guided by a mission to improve the human condition has inspired the many scientists, researchers, and other staff at RTI International for half a century. Strategic decisions and investments made in recent times have set the stage for RTI to shed light on and help solve the problems of the future, from health care and economic development to energy and the environment. Opposite, a small cross-section of people from RTI's many disciplines gathers on the lawn at the institute's campus in its 50th anniversary year, 2008.

Timeline

1956
Research Triangle Committee, Inc., is created to explore the idea of a contract research institute.

1958
Leaders in academia, business, and government establish RTI as the initial research organization and focal point for research in North Carolina's Research Triangle Park. The new institute is owned by three universities: North Carolina State University (NC State), University of North Carolina at Chapel Hill (UNC-Chapel Hill) and Duke University.

George Herbert is named president of RTI.

Gertrude Cox and Alva Finkner join RTI on a part-time basis.

RTI's first project is a family health survey.

1959
RTI's first education-related project is a survey of Raleigh, North Carolina, residents' attitudes about public education.

Grant of $2.5 million from Dreyfus Foundation supports a ten-year program of research in polymers.

1960
RTI's first commercial contract in statistics research division is with Union Carbide Nuclear.

Monroe Wall is hired to head the new Natural Products Laboratory and search the plant kingdom for cancer-fighting compounds. Among the later results are camptothecin and taxol.

1961
RTI's first international project helps the Nigerian government develop an agricultural census.

1962
RTI undertakes its first environmental project, a survey of public health attitudes on threats from air pollution.

RTI's first microelectronics research involves semiconductors, integrated circuits, and thin-film capacitors.

1963
Under its first project for NASA, RTI develops statistical methods for evaluating the reliability of the Nike missile's digital logic systems.

1964
President Lyndon Johnson's War on Poverty guides dollars to RTI for diverse projects in survey research and social sciences.

1965
Meteorological field station opens, marking RTI's entry into atmospheric chemistry research.

RTI researchers isolate camptothecin.

The North Carolina Fund survey, aimed at improving the economic well-being of low-income families by creating new educational and employment opportunities, marks the beginning of RTI's quality-of-life research.

1966
NASA names RTI one of seven teams created to ensure that technologies developed for space exploration are transferred to the commercial marketplace.

1967
Mass spectrometer equipment is purchased to accurately measure trace amounts of chemicals.

1969
RTI signs the first of many research contracts to conduct and administer the National Assessment of Educational Progress (NAEP) survey.

1970
National Institutes of Health announces that camptothecin "stands front stage center" in the search for drugs against colon and rectal cancers.

1971
RTI reports the isolation of taxol from the Pacific yew tree and notes its potential as a cancer-fighting compound.

George Herbert restructures RTI to encourage more multidisciplinary research.

National Institute on Drug Abuse (NIDA) awards grant to RTI to study drug use among recent arrestees.

Research begins on the Autocuer speech-recognition technology.

1972
RTI designs, conducts and administers the first National Longitudinal Study (NLS) of the High School Class of 1972.

RTI researchers develop SUDAAN, a statistical software package for the analysis of correlated data.

1973
RTI is chosen as statistical coordinator for collection, processing, and analysis of clinical data for the Special Supplemental Food Program for Women, Infants, and Children.

1975
RTI's collection of data on crime and misbehavior in schools culminates in publication of the report, *Violent Schools–Safe Schools.*

RTI releases findings on U.S. teenagers' drinking behavior, noting that almost one-quarter of junior and senior high-school students are moderate to heavy drinkers.

RTI begins first Treatment Outcome Prospective Study (TOPS), sponsored by NIDA.

1976
RTI's study for the U.S. Department of the Treasury shows that taxpayers would save millions of dollars if the government eliminated the penny and replaced the dollar bill with a more distinctive coin. The Susan B. Anthony dollar coin later debuts.

RTI helps the government in Morocco plan and carry out measures for curbing malnutrition.

The Center for the Synthesis and Study of Semiconductor Compounds is founded at RTI to investigate materials surpassing silicon in speed, frequency, and power.

Beginning of five-year National Medical Care Expenditures study by RTI to analyze medical services used by Americans, how much they cost, and who pays the bills.

1978
With support from the U.S. Agency for International Development (USAID), RTI begins helping

Tamale, Ghana, implement plans for better health care services, roads, water system, and other infrastructure needs.

RTI and NC State design and build a monolithic cascade solar cell, doubling the efficiency of conventional silicon solar cells.

RTI's assessment of toxicity problems in Niagara Falls, New York, introduces the world to the pollution at Love Canal.

Beginning of RTI's groundbreaking research into cochlear implants for the deaf and hearing impaired.

1979
RTI opens the Asbestos Information Hotline, assisting the U.S. Environmental Protection Agency's (EPA's) Asbestos-in-Schools program.

RTI pioneers the use of computer-assisted telephone interviewing (CATI) in surveys.

1980
RTI undertakes work as a member of Water and Sanitation Health (WASH), providing specialists to developing nations to measure and analyze water and sanitation problems.

Research begins on National Medical Care Utilization and Expenditure Study.

1981
RTI creates Total Exposure and Assessment Methodology (TEAM) to unravel the relationship between an individual's exposure to toxic substances and the amount of the chemical that is in body fluids.

Microelectronics Center of North Carolina is created by RTI and its three founding universities.

1982
RTI undertakes its first assessment of the Special Supplemental Food Program for Women, Infants, and Children.

RTI signs a five-year contract to support the National Cancer Institute's pharmaceutical research.

1983
RTI releases findings from the second biennial Worldwide Survey of Alcohol and Nonmedical Drug Use among Military Personnel.

U.S. Department of Defense (DOD) contracts with RTI to administer the Youth Attitude Tracking Study, assessing military enlistment preferences.

1984
RTI is engaged by the National Toxicology Program to test and provide information about toxic chemicals in industrial and consumer products.

For the Centers for Disease Control, RTI studies soldiers' exposure to Agent Orange during the Vietnam War.

1985
NASA contracts with RTI to develop a wind shear detection device. The first radar-based predictive wind shear detection system is installed on commercial aircraft in 1994.

1986
U.S. Department of Energy funds research at RTI to develop a cleaner and more efficient way of using coal to produce electricity and steam.

RTI receives funding to strengthen Nepal's financial management.

RTI undertakes the first National Postsecondary Student Aid Study (NPSAS).

1987
For the DoD, RTI studies substance abuse and family life issues affecting military job retention.

RTI manages data collection for the largest AIDS clinical trials program in the world.

1988
RTI undertakes the National Survey on Drug Use and Health project, the major source of data on substance use and abuse for policymakers.

RTI releases National Vietnam Veterans Readjustment Study, assessing post-traumatic stress disorder.

1989
F. Thomas Wooten succeeds George Herbert as RTI president.

Food and Drug Administration engages RTI to develop systems for measuring pesticide content on fruit and vegetables.

RTI undertakes the Methadone Enhanced Treatment study.

RTI publishes *Drug Abuse Treatment: A National Study of Effectiveness*, concluding that treatment has achieved notable success in reducing the rate of drug abuse.

RTI's research to understand the biomedical mechanisms involved in cocaine addiction culminates in the development of RTI-55 (now Dopascan), used to diagnose patients with Parkinson's Disease, and RTI-336 and JDTic, to prevent drug relapses.

1994
RTI is funded by EPA to design and administer the National Human Exposure Assessment Survey, a long-term study of the ways that humans are exposed to potentially toxic chemicals in the environment.

1995
RTI develops a new survey tool called audio computer-assisted self-interviewing (ACASI), for use in large-scale field interviewing.

1996
RTI begins assisting the South African government with its transition in education from the apartheid system to one that provides equal opportunity for all.

1997
RTI teams with UNC-Chapel Hill to become an evidence-based practice center of the Agency for Healthcare Research and Quality.

RTI researchers receive the American Otological Society's Presidential Citation for pioneering work in cochlear implant technology

1998
RTI conducts the first National Survey of Child and Adolescent Well-being.

1999
Victoria Haynes succeeds Tom Wooten as president and CEO.

RTI undertakes research to generate thermoelectric technology for noise-free stealth submarines

and waste heat recovery systems to cool portable computer microprocessors.

RTI creates the North Carolina CoOp in Durham to help curb the high incidence of AIDS.

An RTI study indicates that St. John's wort is ineffective in treating depression.

EPA selects RTI for the chemical speciation of particulate matter with a diameter of 2.5 micrometers or less.

2000

RTI spins off a new company, Ziptronix, to produce integrated circuits that are less expensive, faster, and more powerful than existing chips.

RTI develops AVATALK, an interactive, virtual reality technology used to teach police officers how to interview mentally ill individuals.

RTI launches RTI Health Solutions to provide consulting and research expertise to pharmaceutical companies.

2001

RTI announces the first significant breakthrough in thermoelectric research in 40 years: a new thin-film superlattice material that is 2.4 times more efficient and 23,000 times faster than current technology.

RTI launches its Fellow Program.

2002

An RTI-funded study estimates that more than a half-million people in the New York City metropolitan area may have developed post-traumatic stress disorder in the wake of the September 11, 2001, terrorist attacks.

RTI scientists develop nanoengineered membranes that could enable a new generation of highly efficient separation devices for application in petroleum, chemical, and fuel production, and environmental cleanup.

RTI studies the effectiveness of the American Legacy Foundation's youth smoking-prevention campaign.

RTI undertakes the Education Longitudinal Study, testing ninth graders in math and science.

RTI acquires Health Economics Research, a leading contractor for the Centers for Medicare and Medicaid Services.

2003

RTI begins a project for USAID to establish democratically elected local governments throughout post-conflict Iraq.

RTI's Pretoria, South Africa, office begins a five-year study to improve women-focused HIV-prevention and intervention programs.

An RTI survey indicates that obesity costs the nation $93 billion a year, half of it paid for by Medicare and Medicaid.

The American Chemical Society commemorates the discovery of taxol and camptothecin.

2004

RTI is contracted by officials in Beijing, China, to develop an air quality management system to support efforts to control air pollution in advance of the 2008 Olympics in Beijing.

EPA awards a contract to RTI to help revise the Pollution Abatement Costs and Expenditures Survey (PACE), the only comprehensive source of the actual costs of environmental regulations.

2005

RTI wins an R&D 100 award for a technology that removes large amounts of pollution from synthetic coal gas, expanding the prospect for coal to replace imported petroleum and natural gas.

RTI forges an innovative path in drug development by using a unique, public-private partnership to bring an affordable new tuberculosis drug, PA-824, to clinical trials.

RTI acquires three divisions from MCNC Research and Development Institute involved in microfabrication, signal electronics, and network systems and security.

RTI spins off Nextreme Thermal Solutions, commercializing its groundbreaking thermoelectric technology.

The Children's Media Use study, conducted by RTI on the relationship between obesity and television viewing by children, is released.

RTI studies how media campaigns and government policies influence tobacco use.

The National Center for Education Statistics releases data from the RTI-conducted Education Longitudinal Study of 2002. It includes detailed information about student achievements in reading and math.

2006

RTI begins supporting direct interventions for malaria control in Angola, treating the homes of more than 600,000 people to prevent the spread of malaria. The program expands a year later to ten African countries, and the homes of more than two million people are treated.

USAID engages RTI in the Early Grade Reading Assessment program to assess reading skills.

RTI researchers publish a paper in *Nature* reporting on the best strategies for responding to a possible avian flu pandemic.

2007

RTI Health Solutions helps the drug Tysabri get reintroduced to the market as a treatment for multiple sclerosis.

RTI launches the RTI Press as a means to share its knowledge and expertise with scientific and policy audiences globally.

RTI research for the National Toxicology Program indicates that chromium in drinking water is a health hazard, linking it to cancer.

RTI acquires Palmer D'Angelo Consulting in Canada.

Ivy Carroll and Monroe Wall are inducted into the American Chemical Society Division of Medicinal Chemistry Hall of Fame.

2008

RTI recruits researchers from the Women's Global Health Imperative at the University of California, San Francisco, enhancing the institute's expertise in HIV/AIDS and reproductive health.

RTI forms a new company, siXis, to develop an innovative technology, developed at RTI, that promises to increase computer performance while reducing the size of circuits and power requirements.

Acknowledgments

Over the many years that I have been an author and journalist, it is rare that I have had the distinct honor of encountering on one project so many esteemed individuals—men and women whose life's work is dedicated to the continual improvement of the human condition. It would be unfair for me to thank just a few people, given the noble mission of all who work at RTI and the eagerness and passion with which so many people shared their stories with me. Suffice it to say that in researching and writing this book, I was absorbed and astounded, and I admired the range of research and science conducted at RTI. To everyone I spoke with, thank you for sharing your time and efforts with me.

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Russ Banham
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